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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPERS

Nos. 281-283

WASHINGTON
GOVERNMENT PRINTING OFFICE
1913

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Water-supply paper 281; Surface water supply of United States, 1910, pt. 1, North Atlantic Coast.

Same 282; Surface water supply of United States, 1910, pt. 2, South Atlantic Coast and eastern Gulf of Mexico.

Same 283; Surface water supply of United States, 1910, pt. 3, Ohio River basin.

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 281

SURFACE WATER SUPPLY OF THE UNITED STATES

1910

PART I. NORTH ATLANTIC COAST

PREPARED UNDER THE DIRECTION OF M. O. LEIGHTON

BY

C. C. BABB, C. C. COVERT
AND R. H. BOLSTER

WASHINGTON
GOVERNMENT PRINTING OFFICE
1912

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SURFACE WATER SUPPLY OF THE NORTH ATLANTIC COAST, 1910.

By C. C. Babb, C. C. Covert, and R. H. Bolster.

INTRODUCTION.

AUTHORITY FOR INVESTIGATIONS.

This volume contains results of measurements of the flow of certain streams in the United States. The work was performed by the water-resources branch of the United States Geological Survey, either independently or in cooperation with private or State organizations. The organic law of the Geological Survey (Stat. L., vol. 20, p. 394) contains the following paragraph:

> *Provided*, That this officer [the Director] shall have the direction of the geological survey and the classification of public lands and examination of the geological structure, mineral resources, and products of the national domain.

As water is the most abundant and most valuable of the minerals, the investigation of water resources is authorized under the provision for examining mineral resources. The work has been supported since the fiscal year ending June 30, 1895, by appropriations in successive sundry civil bills passed by Congress under the following item:

> For gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources.

The various appropriations that have been made for this purpose are as follows:

Annual appropriations for the fiscal year ending June 30—

1895	$12,500
1896	20,000
1897 to 1900, inclusive	50,000
1901 to 1902, inclusive	100,000
1903 to 1906, inclusive	200,000
1907	150,000
1908 to 1910, inclusive	100,000
1911	150,000

SCOPE OF INVESTIGATIONS.

These investigations are not complete nor do they include all streams that might be advantageously studied. The scope of the work is limited by the appropriations available. The field covered is

the widest and the character of the work is believed to be the best possible under the controlling conditions. The work would undoubtedly have greater scientific importance and ultimately be of more practical value if the money now expended for wide areas were concentrated on a few small drainage basins, but such a course is impossible because general appropriations made by Congress are applicable to all parts of the country. Each part demands its proportionate share of the benefits.

It is essential that records of stream flow shall be kept during a period of years long enough to determine within reasonable limits the entire range of flow from the absolute maximum to the absolute minimum. The length of such a period manifestly differs for different streams. Experience has shown that the records for some streams should cover 5 to 10 years, and those for other streams 20 years or even more, the limit being determined by the relative importance of the stream and the interdependence of the results with other long-time records on adjacent streams.

In the performance of this work an effort is made to reach the highest degree of precision possible with a reasonable expenditure of time and a judicious expenditure of a small amount of money. In all engineering work there is a point beyond which refinement is needless and wasteful, and this statement applies with especial force to stream-flow measurements. It is confidently believed that the stream-flow data presented in the publications of the Survey are in general sufficiently accurate for all practical purposes. Many of the records are, however, of insufficient length, owing to the unforeseen reduction of appropriations and consequent abandonment of stations. All persons are cautioned to exercise the greatest care in using such incomplete records.

Records have been obtained at nearly 2,000 different points in the United States. The surface water supply of small areas in Seward Peninsula and the Yukon-Tanana region, Alaska, and in Hawaii has also been investigated. During 1910 regular gaging stations were maintained by the Survey and cooperating organizations at about 1,100 points in the United States, and many discharge measurements were made at other points. Data were also obtained in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in the regular surface water-supply papers and in special papers from time to time.

PUBLICATIONS.

The data on stream flow collected by the United States Geological Survey have appeared in the annual reports, bulletins, and water-supply papers. Owing to natural processes of evolution and to changes in governmental requirements, the character of the work

and the territory covered by these different publications have varied greatly. For the purpose of uniformity in the presentation of reports a general plan has been agreed upon by the United States Reclamation Service, the United States Forest Service, the United States Weather Bureau, and the United States Geological Survey, according to which the area of the United States has been divided into twelve parts, whose boundaries coincide with certain natural drainage lines. The areas so described are indicated by the following list of papers on surface-water supply for 1910. The dividing line between the North Atlantic and South Atlantic drainage areas lies between York and James rivers.

Papers on surface water supply of the United States, 1910.

Part.	No.	Title.
I	281	North Atlantic coast.
II	282	South Atlantic coast and eastern Gulf of Mexico.
III	283	Ohio River basin.
IV	284	St. Lawrence River basin.
V	285	Upper Mississippi River and Hudson Bay basins.
VI	286	Missouri River basin.
VII	287	Lower Mississippi River basin.
VIII	288	Western Gulf of Mexico.
IX	289	Colorado River basin.
X	290	Great Basin.
XI	291	Pacific coast in California.
XII	292	North Pacific coast.

The following table gives the character of data regarding stream flow at regular stations, to be found in the various publications of the United States Geological Survey, exclusive of special papers:

Stream-flow data in reports of the United States Geological Survey.

[A.=Annual Report; B.=Bulletin; W. S.=Water-Supply Paper.]

Report.	Character of data.	Year.
10th A., pt. 2	Descriptive information only	
11th A., pt. 2	Monthly discharge	1884 to Sept., 1890.
12th A., pt. 2	do	1884 to June 30, 1891.
13th A., pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A., pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B. 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A., pt. 2	Descriptive information only	
B. 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
W. S. 11	Gage heights (also gage heights for earlier years)	1896.
18th A., pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for earlier years).	1895 and 1896.
W. S. 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
W. S. 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A., pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
W. S. 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.
W. S. 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1898.

Stream-flow data in reports of the United States Geological Survey—Continued.

Report.	Character of data.	Year.
20th A., pt. 4	Monthly discharge (also for many earlier years)	1898.
W. S. 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A., pt. 4	Monthly discharge	1899.
W. S. 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A., pt. 4	Monthly discharge	1900.
W. S. 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
W. S. 75	Monthly discharge	1901.
W. S. 82 to 85	Complete data	1902.
W. S. 97 to 100	do	1903.
W. S. 124 to 135	do	1904.
W. S. 165 to 178	do	1905.
W. S. 201 to 214	Complete data, except descriptions	1906.
W. S. 241 to 252	Complete data	1907–8.
W. S. 261 to 272	do	1909.
W. S. 281 to 292	do	1910.

NOTE.—No data regarding stream flow are given in the 15th and 17th annual reports.

The records at most of the stations discussed in these reports extend over a series of years. An index of the reports containing records prior to 1904 has been published in Water-Supply Paper 119.

The first table which follows gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1910. Wherever the data for a drainage basin appear in two papers the number of one is placed in parentheses and the portion of the basin covered by that paper is indicated in the second table. For example, in 1904 the data for Missouri River were published in Water-Supply Papers 130 and 131, and the portion of the records contained in Water-Supply Paper 131, as indicated by the second table, is that relating to Platte and Kansas rivers.

Numbers of water-supply papers containing results of stream measurements, 1899–1910.

	1899 [a]	1900 [b]	1901	1902	1903
Atlantic coast and eastern Gulf of Mexico:					
New England rivers	35	47	65, 75	82	97
Hudson River to Delaware River, inclusive	35	47, (48)	65, 75	82	97
Susquehanna River to York River, inclusive	35	48	65, 75	82	97
James River to Yadkin River, inclusive	(35), 36	48	65, 75	(82), 83	(97), 98
Santee River to Pearl River, inclusive	36	48	65, 75	83	98
St. Lawrence River	36	49	65, 75	(82), 83	97
Hudson Bay	.....	.....	66, 75	85	100
Mississippi River:					
Ohio River	36	48, (49)	65, 75	83	98
Upper Mississippi River	36	49	65, 75	83	98, (99)
Missouri River	(36), 37	49, (50)	66, 75	84	99
Lower Mississippi River	37	50	(65), 66, 75	(83), 84	(98), 99
Western Gulf of Mexico	37	50	66, 75	84	99
Pacific coast and Great Basin.					
Colorado River	(37), 38	50	66, 75	85	100
Great Basin	38, (39)	51	66, 75	85	100
South Pacific coast to Klamath River, inclusive	(38), 39	51	66, 75	85	100
North Pacific coast	38	51	66, 75	85	100

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39.
[b] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52.

Numbers of water-supply papers containing results of stream measurements, 1899–1910—Continued.

	1904	1905	1906	1907–8	1909	1910
Atlantic coast and eastern Gulf of Mexico:						
New England rivers	124	165	201	241	261	281
Hudson River to Delaware River, inclusive	125	166	202	241	261	281
Susquehanna River to York River, inclusive	126	167	203	241	261	281
James River to Yadkin River, inclusive	126	167	203	242	262	282
Santee River to Pearl River, inclusive.	127	168	204	242	262	282
St. Lawrence River	129	170	206	244	264	284
Hudson Bay	130	171	207	245	265	285
Mississippi River:						
Ohio River	128	169	205	243	263	283
Upper Mississippi River	128, (130)	171	207	245	265	285
Missouri River	130, (131)	172	208	246	266	286
Lower Mississippi River	(128), 131	(169), 173	(205), 209	247	267	287
Western Gulf of Mexico	132	174	210	248	268	288
Pacific coast and Great Basin:						
Colorado River	133, (134)	175, (177)	211, (213)	249, (251)	269, (271)	289
Great Basin	133, (134)	176, (177)	212, (213)	250, (251)	270, (271)	290
South Pacific coast to Klamath River, inclusive	134	177	213	251	271	291
North Pacific coast	135	(177), 178	214	252	272	292

Numbers of water-supply papers containing data covering portions of drainage basins.

No.	River basin.	Tributaries included.
35	James	
36	Missouri	Gallatin.
37	Colorado	Green, Gunnison, Grand above junction with Gunnison.
38	Sacramento	Except Kings and Kern.
39	Great Basin	Mohave.
48	Delaware	Wissahickon and Schuylkill.
49	Ohio	Scioto.
50	Missouri	Loup and Platte near Columbus, Nebr. All tributaries below junction with Platte.
65	Lower Mississippi	Yazoo.
82	James	
	St. Lawrence	Lake Ontario, tributaries to St. Lawrence River proper.
83	Lower Mississippi	Yazoo.
97	James	
98	Lower Mississippi	Yazoo.
99	Upper Mississippi	Tributaries from the west.
128	Lower Mississippi	Yazoo.
130	Upper Mississippi	Tributaries from the west.
131	Missouri	Platte, Kansas.
134	Colorado	Data near Yuma, Ariz., repeated.
	Great Basin	Susan, Owens, Mohave.
169	Lower Mississippi	Yazoo.
177	Colorado	Below junction with Gila.
	Great Basin	Susan repeated, Owens, Mohave.
	North Pacific coast	Rogue, Umpqua, Siletz.
205	Lower Mississippi	Yazoo, Homochitto.
213	Colorado	Data at Hardyville repeated; at Yuma, Salton Sea.
	Great Basin	Owens, Mohave.
251	Colorado	Yuma and Salton Sea stations repeated.
271	Great Basin	Owens River basin.

The order of treatment of stations in any basin in these papers is downstream. The main stem of any river is determined by measuring or estimating the drainage area; that is, the headwater stream having the largest drainage area is considered the continuation of the main stream and local changes in name and lake surface are disregarded. Records for all stations from the source to the mouth of the main stem of the river are presented first, and records for the tributaries in regular order from source to mouth follow, all

records in each tributary basin being given before those of the next basin below.

The exceptions to this rule occur in the records for Mississippi River, which are given in four parts, as indicated above, and in the record for large lakes, where it is simpler to take up the streams in regular order around the rim of the lake than to cross back and forth over the lake surface.

DEFINITION OF TERMS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and run-off in second-feet per square mile, and (2) those which represent the actual quantity of water, as run-off in depth in inches and acre-feet. The units used in this series of reports are second-feet, second-feet per square mile, run-off in inches, and acre-feet. They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second and is the unit for the rate of discharge of water in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed by the use of the factors given in the table of equivalents below.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

An "acre-foot" is equivalent to 43,560 cubic feet and is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation work.

CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:

1 second-foot equals 40 California miner's inches (law of Mar. 23, 1901).

1 second-foot equals 38.4 Colorado miner's inches.

1 second-foot equals 40 Arizona miner's inches.

1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.

1 second-foot equals 6.23 British imperial gallons per second.
1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day covers 1 square mile 0.03719 inch deep.
1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
1 second-foot for one day equals 1.983 acre-feet.
1 second-foot for one 28-day month equals 55.54 acre-feet.
1 second-foot for one 29-day month equals 57.52 acre-feet.
1 second-foot for one 30-day month equals 59.50 acre-feet.
1 second-foot for one 31-day month equals 61.49 acre-feet.
100 California miner's inches equals 18.7 United States gallons per second.
100 California miner's inches equals 96 Colorado miner's inches.
100 California miner's inches for one day equals 4.96 acre-feet.
100 Colorado miner's inches equals 2.60 second-feet.
100 Colorado miner's inches equals 19.5 United States gallons per second.
100 Colorado miner's inches equals 104 California miner's inches.
100 Colorado miner's inches for one day equals 5.17 acre-feet.
100 United States gallons per minute equals 0.223 second-foot.
100 United States gallons per minute for one day equals 0.442 acre-foot.
1,000,000 United States gallons per day equals 1.55 second-feet.
1,000,000 United States gallons equals 3.07 acre-feet.
1,000,000 cubic feet equals 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1⅓ horsepower equals about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of theoretical power.

EXPLANATION OF DATA.

For each drainage basin there is given a brief general description covering such items as area, source, tributaries, topography, geology, forestation, rainfall, irrigation, storage, power, and other interesting and important facts.

For each regular current-meter gaging station the following data, so far as available, are given: Description of station, list of discharge measurements, table of daily gage heights, table of daily discharges, table of monthly and yearly discharges and run-off. For stations located at weirs or dams the gage-height table is omitted.

In addition to statements regarding the location and installation of current-meter stations, the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such points as ice, logging, shifting channels, and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the accuracy and reliability of the data.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of hydrographer, width and area of cross section, gage height, and discharge in second-feet.

The table of daily gage heights records the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day. At most stations the gage is read in the morning and in the evening. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. All gage heights affected by the presence of ice in the streams or by backwater from obstructions are published as recorded, with suitable footnotes. The rating table is not applicable for such periods unless the proper corrections to the gage heights are known and applied. Attention is called to the fact that the zero of the gage is placed at an arbitrary datum and has no relation to zero flow or the bottom of the river. In general, the zero is located somewhat below the lowest known flow, so that negative readings shall not occur.

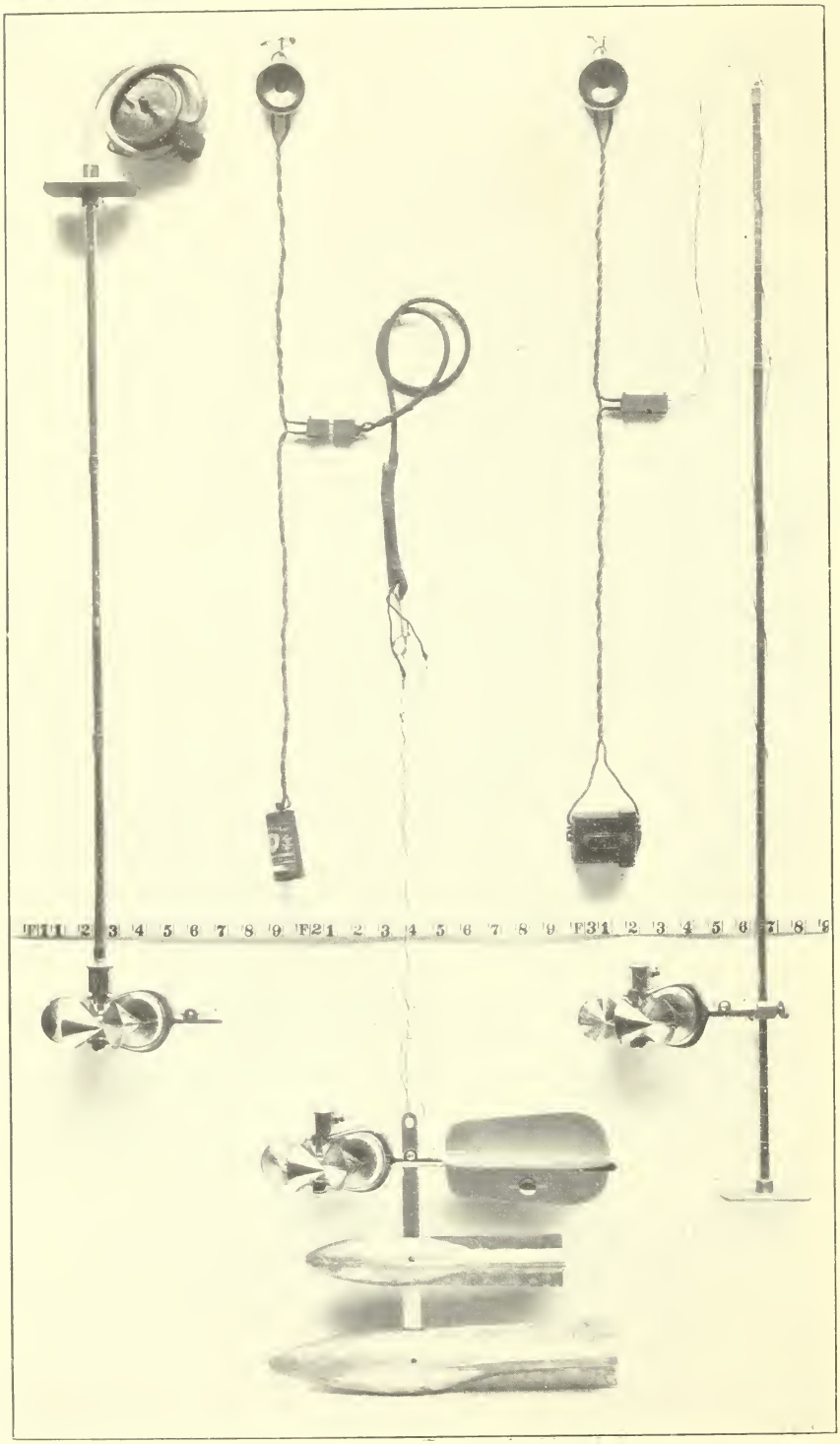
The discharge measurements and gage heights are the base data from which rating tables, daily discharge tables, and monthly discharge tables are computed.

The rating table gives, either directly or by interpolation, the discharge in second-feet corresponding to every stage of the river recorded during the period for which it is applicable. It is not published in this report, but can be determined from the daily gage

A. FOR BRIDGE MEASUREMENT.

B. FOR WADING MEASUREMENT.

TYPICAL GAGING STATIONS.



SMALL PRICE CURRENT METERS.

heights and daily discharges, for the purpose of verifying the published results as follows:

First plot the discharge measurements for the current and earlier years on cross-section paper with gage heights in feet as ordinates and discharge in second-feet as abscissas. Then tabulate a number of gage heights taken from the daily gage-height table for the complete range of stage given and the corresponding discharges for the days selected from the daily discharge table and plot the values on cross-section paper. The last points plotted will define the rating curve used and will lie among the plotted discharge measurements. After drawing the rating curve, a table can be developed by scaling off the discharge in second-feet for each tenth foot of gage height. These values should be so adjusted that the first differences shall always be increasing or constant, except for known backwater conditions.

The table of daily discharges gives the discharges in second-feet corresponding to the observed gage heights as determined from the rating tables.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height, and the corresponding discharge was consequently larger than given in the maximum column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this the computations for the remaining columns, which are defined on page 12, are based.

The field methods used in the collection of the data presented in this series of reports are described in the introductory sections of Water-Supply Papers 261 to 272, inclusive, "Surface water supply of the United States, 1909." Plate I shows typical gaging stations and indicates the method of suspending the current meter; Plate II shows the various types of current meters[1] used in the work.

ACCURACY AND RELIABILITY OF FIELD DATA AND COMPARATIVE RESULTS.

The accuracy of stream-flow data depends, first, on the natural conditions at the gaging station and, second, on the methods and care with which the data are collected. Errors of the first class depend on the degree of permanency of channel and of the relation of gage height to discharge.

[1] See Hoyt, J. C., and others, Use and care of the current meter as practiced by the United States Geol. Survey: Trans. Am. Soc. Civil Eng., vol. 66, 1910, p. 70.

Errors of the second class are due, first, to errors in observation of stage; second, to errors in measurements of flow; and, third, to errors due to misinterpretation of stage and flow data.

Practically all discharge measurements made under fair conditions are well within 5 per cent of the true discharge at the time of observation. Inasmuch as the errors of meter measurements are largely compensating, the mean rating curve, when well defined, is much more accurate than the individual measurements. Numerous experiments made to test the accuracy of current-meter work show that it compares very favorably with the results from standard weirs and, owing to simplicity of methods, usually gives results that are much more reliable than those from stations at dams, where the coefficient may be uncertain and conditions of flow are complicated.

The work is, of course, dependent on the reliability of the gage observers. With comparatively few exceptions, the observers perform their work honestly. The records are, however, closely watched, and the cause of any discrepancy is investigated. It is obvious that one gage reading a day does not always give the mean height for that day. As an almost invariable rule, however, errors from this source are compensating and virtually negligible in the period of one month, although a single day's reading may, when taken by itself, be considerably in error.

An effort is made to visit every station at least once each year for the purpose of making a measurement to determine the constancy of conditions of flow since the last measurement made the preceding year and also to check the elevation of the gage. On account of lack of funds or for other causes some stations were not visited during the current year. If conditions of flow have been reasonably permanent up to the time of the last preceding measurement, it is considered best to publish estimates of discharge based on the latest verified rating curve rather than to omit them altogether, although it should be distinctly understood that such records are at times subject to considerable error. This is also true, although to a less degree, of the period of records since the date of the last measurement of the current year. As a rule, the accuracy notes are based on the assumption that the rating curve used is strictly applicable to the current year.

In order to give engineers and others information regarding the probable accuracy of the computed results, footnotes are added to the daily-discharge tables, stating the probable accuracy of the rating tables used, and an accuracy column is inserted in the monthly-discharge table. For the rating tables "well defined" indicates, in general, that the rating is probably accurate within 5 per cent; "fairly well defined," within 10 per cent; "poorly defined" or "approximate," within 15 to 25 per cent. These notes are very general

and are based on the plotting of the individual measurements with reference to the mean rating curve.

The accuracy column in the monthly-discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean. It is based on the accuracy of the rating, the probable reliability of the observer, and knowledge of local conditions. In this column, A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

USE OF THE DATA.

In general, the base data which are collected in the field each year by the Survey engineers are published, not only to comply with the law but also for the express purpose of giving to any engineer the opportunity of examining the computed results and of changing and adjusting them as may seem best to him. Although it is believed that the rating tables and computed monthly discharges are as good as the base data up to and including the current year will warrant, it should always be borne in mind that the additional data collected at each station from year to year nearly always throw new light on data already collected and published and hence allow more or less improvement in the computed results of earlier years. It is therefore expected that the engineer who makes serious use of the figures presented in these papers will verify all ratings and make such adjustments for earlier years as may seem necessary. The work of compiling, studying, revising, and republishing data for different drainage basins for 5 or 10 year periods or more is carried on by the United States Geological Survey so far as the funds for such work are available.

The estimates in the table of monthly discharge are so arranged as to give only a general idea of the conditions of flow at the station, and it is not expected that they will be used for other than preliminary estimates.

The daily discharges are published to allow a more detailed study of the variation in flow and to determine the periods of deficient flow.

COOPERATIVE DATA.

Cooperative data of various kinds and data regarding the run-off at many stations maintained wholly by private funds are incorporated in the surface-water supply reports of the United States Geological Survey.

Many stations throughout the country are maintained for specific purposes by private parties, who supply the records gratuitously to

the United States Geological Survey for publication. When such records are furnished by responsible parties and appear to be reasonably accurate, they are verified, so far as possible, and estimated values of accuracy are given. Records clearly worthless or misleading are not published. As it is, however, impossible to completely verify all such records furnished—because of lack of funds or for other causes—they are published for what they are worth, as they are of value as a matter of record and afford at least approximate information regarding stream flow at the particular localities. The Survey does not, however, assume any responsibility for inaccuracies found in such records, although most of them are believed to be reasonably good.

COOPERATION AND ACKNOWLEDGMENTS.

NEW ENGLAND.

Assistance has been rendered or records furnished in New England by the following, to whom special acknowledgment is due:

Maine State Water Storage Commission, Bert M. Fernald, governor, chairman; Maine State Survey Commission; M. H. Ranney, chief engineer for International Commission, River St. John; the State of Vermont, George H. Prouty, governor; the State of Massachusetts, Eben S. Draper, governor; Natural Resources Survey of Rhode Island, Prof. Charles W. Brown, superintendent; C. M. Tolman, engineer for Bar Harbor & Union River Power Co.; Sellers & Rippey; H. B. Moor; H. F. Lord; H. S. Ferguson, engineer for Great Northern Paper Co.; A. D. Butterfield; Fred Cort; F. E. Boston, manager, and George H. Marr, engineer for Hollingsworth & Whitney Co.; C. A. Mixer, engineer for Rumford Falls Power Co.; Walter H. Sawyer, agent for Union Water Power Co.; Joseph A. Warren, of S. D. Warren & Co.; J. A. Fleet, general manager for Portland Electric Co.; J. Brodie Smith, manager of Manchester Traction, Light & Power Co.; R. A. Hale, principal assistant engineer of Essex Co.; Arthur T. Safford, principal assistant engineer of Locks & Canals Co.; Dexter Brackett, chief engineer of Metropolitan Water and Sewerage Board; Charles Bigelow, treasurer of Haile & Frost Manufacturing Co.; Frederick S. Leonard, of Fisk Paper Co.; Charles Of, general superintendent, and H. M. Sumner, engineer for Vermont Copper Co.; International Paper Co.; Bellows Falls Canal Co.; C. W. Hazelton, treasurer of Turners Falls Co.; H. I. Harriman, general manager of Connecticut River Power Co.; A. F. Sickman, hydraulic engineer, Holyoke Water Power Co.; Greenfield Electric Light & Power Co.; Otis Co.; George H. Gilbert Manufacturing Co.; E. E. Lochridge, engineer Springfield Water Board; Charles T. Main; Prof. George F. Swain; William D. Thompson, engineer, and A. W. Hubbard, manager, of Orange Electric Light Co.; Hollis French; McElwain Co.;

C. S. Taylor, of Taylor Manufacturing Co.; F. J. Pitts, of James Pitts & Sons; Barrows & Breed, consulting engineers; P. M. Churchill; and S. F. Dunlap, of East Providence Water Co.

NEW YORK.

Assistance has been rendered or records furnished in New York by the following, to whom special acknowledgment is due: Hon. Frank M. Williams, State engineer and surveyor, William B. Landreth, special deputy State engineer, representing New York State cooperation; State Water Supply Commission of New York, Hon. Henry H. Persons, president, Walter McCulloh, consulting engineer; New York Additional Water Supply Commission, J. Waldo Smith, chief engineer; United States Weather Bureau; R. P. Bloss, engineer, West Virginia Pulp & Paper Co.; Union Bag & Paper Co.

The stream-gaging work in New York was carried on during 1910 in cooperation with the State engineer and surveyor, and the State Water Supply Commission.

Since April 13, 1900, there has been on the statutes of New York State an act providing for cooperation between the United States Geological Survey and the State engineer and surveyor under "the measurement of volume of streams and flow of water in the State of New York." The appropriation made available by this act was contingent upon an appropriation of an equal amount by the United States Geological Survey. During the last three or four years the amount appropriated by each has been $1,500.

The passing by the State legislature in 1907 of certain laws relating to water-supply investigation made it necessary for the State Water Supply Commission to obtain additional data regarding the discharge of certain streams in the State. At the request of the Water Supply Commission the Geological Survey undertook to carry on this work, the appropriations being made by the Water Supply Commission. Subsequent legislative acts have added to the duties of the Water Supply Commission, increased its appropriations, and led to the enlargement of the stream-gaging work, and on July 1, 1910, the Water Supply Commission made an appropriation of $10,000 toward this work, an increase of $6,500 over that of 1909. This appropriation of $10,000 was made for the following purposes:

Stream gaging	$7,500
Rainfall records	1,500
Evaporation records	1,000

Nothing was done, however, toward evaporation work, and the total amount was used on stream gaging and investigations of rainfall.

The appropriations available for this work during the year ending December 31, 1910, were as follows:

Unexpended balance in United States Geological Survey fund Jan. 1, 1910	$1,192.93
Unexpended balance in Water Supply Commission fund Jan. 1, 1910	1,574.25
Unexpended balance in State engineer's fund Jan. 1, 1910	290.83
	3,058.01

During the year the following additional appropriations were made:

June 27, State engineer	$1,500
July 1, United States Geological Survey	2,500
Water Supply Commission	10,000
	14,000

The unexpended balances from these appropriations January 1, 1911, were as follows:

United States Geological Survey	$1,585.24
Water Supply Commission	5,344.16
State engineer	590.01
	7,519.41

There remained unexpended from all funds July 1, 1910, $141.53, which was canceled, making the net total expenditure for the year $9,397.07.

With these funds 34 stream-gaging stations and 15 rainfall stations were maintained. Two hundred and twenty-five discharge measurements were made during the year.

NEW JERSEY, PENNSYLVANIA, MARYLAND, AND VIRGINIA.

Assistance has been rendered or records furnished in New Jersey, Pennsylvania, Maryland, and Virginia by the following, to whom special acknowledgment is due: United States Weather Bureau; Water Supply Commission of Pennsylvania, John Birkinbine, chairman, Farley Gannett, engineer; Philadelphia Bureau of Water, John E. Codman, in charge of hydrographic work; J. A. Walls, chief engineer, Pennsylvania Water & Power Co.; William C. Whitner, president, Fredericksburg Power Co.

DIVISION OF WORK.

In accordance with a cooperative agreement between the Director of the United States Geological Survey and the governor of Maine, ex officio chairman of the State Water Storage Commission, a new district, known as the Maine district, with headquarters at Augusta, was established December 1, 1909. The work was placed in charge of C. C. Babb, district engineer, who has been aided by F. E. Pressey, assistant engineer.

The field data of New York and for New England, exclusive of Maine, were collected under the direction of C. C. Covert, district engineer, assisted by W. G. Hoyt, F. J. Shuttleworth, and J. J. Phelan, junior engineers.

The field data for the Middle Atlantic States were collected under the direction of R. H. Bolster, assistant engineer, assisted by G. C. Stevens, junior engineer.

The ratings, computations, ice estimates, and special studies were made by C. C. Babb, assisted by F. E. Pressey; C. C. Covert, assisted by W. G. Hoyt, F. J. Shuttleworth, and J. J. Phelan; and R. H. Bolster, assisted by G. C. Stevens, J. G. Mathers, M. I. Walters, A. H. Tuttle, O. DeCarre, and A. McMillan.

The manuscript for Maine was reviewed by C. C. Babb, and that for New England and New York by C. C. Covert. The complete manuscript was edited by Mrs. B. D. Wood.

LIST OF GAGING STATIONS MAINTAINED IN THE NORTH ATLANTIC COAST DRAINAGE BASINS.

The following list comprises the gaging stations maintained in the North Atlantic coast drainage basins (from St. John River to York River) by the United States Geological Survey and cooperative parties. Data for these stations have been published in the reports listed on pages 9 to 11. The stations are arranged by river basins, in downstream order, tributaries of main streams being indicated by indention. (See p. 11.)

ST. JOHN RIVER BASIN.

St. John River near Dickey, Me., 1910.
St. John River at Fort Kent, Me., 1905–1910.
St. John River at Van Buren, Me., 1910.
    Allagash River near Allagash, Me., 1910.
    St. Francis River, near St. Francis, Me., 1910.
    Fish River at Wallagrass, Me., 1903–1908.
    Madawaska River at Ste. Rose du Degele, P. Q., 1910.
    Aroostook River at Fort Fairfield, Me., 1903–1910.

ST. CROIX RIVER BASIN.

St. Croix River near Woodland, Me., 1902–1910.
    West Branch St. Croix River at Baileyville, Me., 1910.

MACHIAS RIVER BASIN.

Machias River at Whitneyville, Me., 1903–1910.

UNION RIVER BASIN.

Union River, West Branch, at Amherst, Me., 1909–10.
Union River, West Branch, near Mariaville, Me., 1909.
Union River at Ellsworth, Me., 1909–10.
    Union River, East Branch, near Waltham, Me., 1909.
    Webbs Brook at Waltham, Me., 1909.

Union River basin—Continued.
Green Lake at Green Lake, Me., 1909–10.
Green Lake Stream at Lakewood, Me., 1909–10.
Branch Lake near Ellsworth, Me., 1909–10.
Branch Lake Stream near Ellsworth, Me., 1909–10.

PENOBSCOT RIVER BASIN.

Penobscot River, West Branch, at Millinocket, Me., 1901–1910.
Penobscot River at West Enfield, Me., 1901–1910.
Penobscot River at Sunk Haze Rips, near Costigan, Me., 1899–1900.
Penobscot River, East Branch, at Grindstone, Me., 1902–1910.
Mattawamkeag River at Mattawamkeag, Me., 1902–1910.
Piscataquis River near Foxcroft, Me., 1902–1910.
Cold Stream at Enfield, Me., 1904–1906.
Kenduskeag Stream near Bangor, Me., 1908–1910.
Phillips Lake Outlets at Holden and Dedham, Me., 1904–1908.

KENNEBEC RIVER BASIN.

Moose River (head of Kennebec River) near Rockwood, Me., 1902–1908 and 1910.
Moosehead Lake at Greenville, Me., 1903–1908 (stage only).
Moosehead Lake at East Outlet, Me., 1895–1910 (stage only).
Kennebec River at The Forks, Me., 1901–1910.
Kennebec River at Bingham, Me., 1907–1910.
Kennebec River at North Anson, Me., 1901–1907.
Kennebec River at Waterville, Me., 1891–1910.
Roach River at Roach River, Me., 1901–1908.
Dead River near The Forks, Me., 1901–1907 and 1910.
Carrabassett River at North Anson, Me., 1901–1907.
Sandy River near Farmington, Me., 1910.
Sandy River at Madison, Me., 1904–1908.
Sebasticook River at Pittsfield, Me., 1908–1910.
Messalonskee Stream at Waterville, Me., 1903–1905.
Cobbosseecontee Stream at Gardiner, Me., 1890–1910.

ANDROSCOGGIN RIVER BASIN.

Androscoggin River at Errol Dam, N. H., 1905–1910.
Androscoggin River at Gorham, N. H., 1903 (fragmentary).
Androscoggin River at Shelburne, N. H., 1903–1907 and 1910.
Androscoggin River at Rumford Falls, Me., 1892–1910.
Androscoggin River at Dixfield, Me., 1902–1908.

PRESUMPSCOT RIVER BASIN.

Presumpscot River at outlet of Sebago Lake, Me., 1887–1910.

SACO RIVER BASIN.

Saco River near Center Conway, N. H., 1903–1910.
Saco River at West Buxton, Me., 1907–1910.

MERRIMAC RIVER BASIN.

Pemigewasset River at Plymouth, N. H., 1886–1910.
Merrimac River at Franklin Junction, N. H., 1903–1910.
Merrimac River at Garvins Falls, N. H., 1904–1910.

Merrimac River at Lawrence, Mass., 1890–1910.
Contoocook River at West Hopkinton, N. H., 1903–1907.
Suncook River at East Pembroke, N. H., 1904–5.
Souhegan River at Merrimac, N. H., 1909–10.
South Branch of Nashua River at Clinton, Mass., 1897–1910.
Sudbury River at Framingham, Mass., 1875–1910.
Lake Cochituate at Cochituate, Mass., 1863–1910.

MYSTIC RIVER BASIN.

Mystic Lake near Boston, Mass., 1897–1898.

TAUNTON RIVER BASIN.

Matfield River at Elmwood, Mass., 1909–10.
Satucket River near Elmwood, Mass., 1909–10.

TENMILE RIVER BASIN.

Tenmile River near Rumford, R. I., 1909.

BLACKSTONE RIVER BASIN.

Blackstone River at Woonsocket, R. I., 1904–5.
Blackstone River at Berkeley, R. I., 1900–1901.
Branch River at Branch Village, R. I., 1909–10.

WOONASQUATUCKETT RIVER BASIN.

Woonasquatuckett River at Olneyville, R. I., 1910.

PAWTUXET RIVER BASIN.

Pawtuxet River at Harris, R. I., 1909–10.

PAWCATUCK RIVER BASIN.

Wood River at Hope Valley, R. I., 1909–10.

THAMES RIVER BASIN.

Shetucket River at Willimantic, Conn., 1904–5.

CONNECTICUT RIVER BASIN.

Connecticut River at Orford, N. H., 1900–10.
Connecticut River at Sunderland, Mass., 1904–10.
Connecticut River at Holyoke, Mass., 1880–1898.
Connecticut River at Hartford, Conn., 1896–1908.
Israel River above South Branch at Jefferson Highlands, N. H., 1903–1906.
Israel River below South Branch at Jefferson Highlands, N. H., 1903–1907.
Passumpsic River near St. Johnsbury, Vt., 1903 and 1909–10.
Ammonoosuc River at Bretton Woods, N. H., 1903–1907.
Zealand River at Twin Mountain, N. H., 1903–1907.
Little River at Twin Mountain, N. H., 1904–5.
White River near Sharon, Vt., 1903–4 and 1909–10.
Ashuelot River at Winchester, N. H., 1903–4.
Ashuelot River at Hinsdale, N. H., 1907–1910.
Millers River at Wendell, Mass., 1909–10.
Moss Brook at Wendell, Mass., 1909–10.
Deerfield River at Hoosac Tunnel, Mass., 1909–10.
Deerfield River at Shelburne Falls, Mass., 1907–1910.
Deerfield River at Deerfield, Mass., 1904–5.

Connecticut River basin—Continued.
Chicopee River:
Ware River near Ware, Mass., 1904–1908 and 1910.
Burnshirt River near Templeton, Mass., 1909.
Swift River at West Ware, Mass., 1910.
Quaboag River at West Warren, Mass., 1904–1907.
Quaboag River at West Brimfield, Mass., 1909–10.
Westfield River at Knightville, Mass., 1909–10.
Westfield River at Russell, Mass., 1904–5.
Westfield River, Middle Branch, at Goss Heights, Mass., 1910.
Westfield Little River near Blandford, Mass., 1905–1910.
Salmon River at Leesville, Conn., 1905–6.

HOUSATONIC RIVER BASIN.

Housatonic River at Gaylordsville, Conn., 1900–1910.
Tenmile River at Dover Plains, N. Y., 1901–1903.

MIANUS RIVER BASIN.

Mianus River near Stamford, Conn., 1903.
Mianus River at Bedford, N. Y., 1903.

BYRAM RIVER BASIN.

Byram River at Pemberwick, Conn., 1903.
Byram River, West Branch, near Port Chester, N. Y., 1903.
Byram River, East Branch, near Greenwich, Conn., 1903.
Byram River, Middle Branch, near Riverville, Conn., 1903.

HUDSON RIVER BASIN.

Hudson River at North Creek, N. Y., 1907–1910.
Hudson River at Thurman, N. Y., 1907–1910.
Hudson River at Fort Edward, N. Y., 1895–1908.
Hudson River at Mechanicville, N. Y , 1888–1910.
Champlain Canal and Glens Falls Feeder, N. Y., 1910.
Indian Lake Reservoir at Indian Lake, N. Y., 1900–1910.
Schroon Lake near Pottersville, N. Y., 1908–1910.
Schroon River at Riverbank, N Y , 1907–1910.
Schroon River at Warrensburg, N. Y., 1895–1902.
Sacandaga River at Wells, N. Y., 1907–1910.
Sacandaga River at Northville, N Y., 1907–1910.
Sacandaga River (upper bridge) near Hadley, N. Y., 1907–1910.
Sacandaga River (at cable) near Hadley, N. Y., 1910.
Sacandaga River at Union Bag & Paper Co.'s Mill, at Hadley, N. Y., 1909–10.
Sacandaga, West Branch, at Whitehouse, N. Y., 1910.
Battenkill River at Battenville, N. Y., 1908.
Fish Creek at Burgoyne, N. Y., 1904–5 and 1908.
Hoosic River above Eagle Bridge, N. Y., 1910.
Hoosic River at Buskirk, N. Y., 1903–1909.
Mohawk River at Ridge Mills near Rome, N Y., 1898–1900.
Mohawk River at Utica, N. Y., 1901–1903.
Mohawk River at Little Falls, N. Y., 1898–1910.
Mohawk River at Rocky Rift Dam near Indian Castle, N. Y., 1901.
Mohawk River at Schenectady, N. Y., 1899–1901.
Mohawk River at Rexford Flats, N. Y., 1898–1901.

Hudson River basin—Continued.
Mohawk River at Dunsbach Ferry, N. Y., 1898–1910.
Ninemile Creek at Stittville, N. Y., 1898–9.
Oriskany Creek at Coleman, N. Y., 1904–1906.
Oriskany Creek at Wood Road Bridge near Oriskany, N. Y., 1901–1904.
Oriskany Creek at Oriskany State Dam near Oriskany, N. Y., 1898–1906.
Saquoit Creek at New York Mills, N. Y., 1898–1900.
Nail Creek at Utica, N. Y., 1904.
Reels Creek at Deerfield, N. Y., 1901–1904.
Reels Creek at Utica, N. Y., 1901–2.
Johnston Brook at Deerfield, N. Y., 1903–1905.
Starch Factory Creek at New Hartford, N. Y., 1903–1906.
Graefenberg Creek at New Hartford, N. Y., 1903–1906.
Sylvan Glen Creek at New Hartford, N. Y., 1900–1906.
West Canada Creek at Twin Rock Bridge near Grant, N. Y., 1900–1910.
West Canada Creek at Middleville, N Y., 1898–1901.
West Canada Creek at Kast Bridge, N. Y., 1905–1910.
East Canada Creek at Dolgeville, N. Y., 1898–1910.
Garoga Creek 3 miles above junction with Mohawk, 1898–9.
Cayadutta Creek at Johnstown, N Y., 1898–1900.
Schoharie Creek at Prattsville, N. Y., 1902–1910.
Schoharie Creek at Schoharie Falls above Mill Point, 1900–1.
Schoharie Creek at Mill Point, N. Y., 1900–1903.
Schoharie Creek at Fort Hunter, N. Y., 1898–1901.
Schoharie Creek at Erie Canal Aqueduct below Fort Hunter, N. Y., 1900.
Quackenkill Creek at Quackenkill, N. Y., 1894.
Normanskill Creek at French's Mill, N. Y., 1891.
Kinderhook Creek at Wilson's Dam, near Garfield, N. Y., 1893–4.
Kinderhook Creek at East Nassau, N. Y., 1892–1894.
Kinderhook Creek at Rossman, N. Y., 1906–1910.
Catskill Creek at South Cairo, N. Y., 1901–1907.
Esopus Creek at Olivebridge, N. Y., 1903–4.
Esopus Creek near Olivebridge, N. Y. (weir station), 1906–1910.
Esopus Creek at Kingston, N. Y., 1901–1909.
Esopus Creek at Mount Marion, N. Y., 1907–1910.
Rondout Creek at Rosendale, N. Y., 1901–1903, 1905–1910.
Diversion to Delaware and Hudson Canal at Rosendale, N. Y., 1901–1907.
Wallkill River at Newpaltz, N. Y., 1901–1903.
Wappinger Creek at Wappinger Falls, N. Y., 1903–1905.
Fishkill Creek at Glenham, N. Y., 1901–1903.
Foundry Brook at Coldspring, N. Y., 1902–3.
Croton River at Croton Dam, near Croton Lake, N. Y., 1868–1903.

PASSAIC RIVER BASIN.

Passaic River at Millington, N. J., 1903–1906.
Passaic River near Chatham, N. J., 1902–1910.
Passaic River at Two Bridges (Mountain View), N. J., 1901–1903.
Rockaway River at Boonton, N. J., 1903–4.
Pompton River at Pompton Plains, N. J., 1903–4.
Pompton River at Two Bridges (Mountain View), N. J., 1901–1903.
Ramapo River near Mahwah, N. J., 1903–1908.
Wanaque River at Wanaque, N. J., 1903–1905.

RARITAN RIVER BASIN.

Raritan River at Stanton, N. J., 1903–1906.
Raritan River at Finderne, N. J., 1903–1907.
Raritan River at Boundbrook, N. J, 1903–1909.
  Raritan River, North Branch, at Pluckemin, N. J., 1903–1906.
  Millstone River at Millstone, N. J., 1903–4.

DELAWARE RIVER BASIN.

Delaware River, East Branch, at Hancock, N. Y., 1902–1910.
Delaware River at Port Jervis, N. Y., 1904–1910.
Delaware River at Riegelsville, N. J., 1906–1910.
Delaware River at Lambertville, N. J., 1897–1908.
  Delaware River, West Branch, at Hancock, N. Y., 1902–1910.
  Mongaup River near Rio, N. Y., 1909–10.
  Neversink River at Godeffroy, N. Y., 1903, 1909–10.
  Neversink River at Port Jervis, N. Y., 1902–3.
  Paulins Kill at Columbia, N. J., 1908–1909.
  Lehigh River at South Bethlehem, Pa., 1902–1905, 1909–10.
  Lehigh River at Easton, Pa., 1909.
  Musconetcong River at Asbury, N. J., 1903.
  Musconetcong River near Bloomsbury, N. J., 1903–1907.
  Tohickon Creek at Point Pleasant, Pa., 1883–1910.
  Neshaminy Creek below Forks, Pa., 1884–1910.
  Schuylkill River near Philadelphia, Pa., 1898–1910.
    Perkiomen Creek near Frederick, Pa., 1884–1910.
    Wissahickon Creek near Philadelphia, Pa., 1897–1906.

SUSQUEHANNA RIVER BASIN.

Susquehanna River at Colliersville, N. Y., 1907–8.
Susquehanna River at Binghamton, N. Y., 1901–1910.
Susquehanna River at Wysox, Pa., 1908–9.
Susquehanna River at Wilkes-Barre, Pa., 1899–1910.
Susquehanna River at Danville, Pa., 1899–1910.
Susquehanna River at Harrisburg, Pa., 1891–1910.
Susquehanna River at McCalls Ferry, Pa., 1902–1910.
  Chenango River at South Oxford, N. Y., 1903.
  Chenango River near Greene, N. Y., 1908.
  Chenango River at Binghamton, N. Y., 1901–1910.
    Eaton Brook, Madison County, N. Y., 1835.
    Madison Brook, Madison County, N. Y., 1835.
    Tioughnioga River at Chenango Forks, N. Y., 1903.
  Cayuta Creek at Waverly, N. Y., 1898–1902.
  Chemung River at Chemung, N. Y., 1903–1910.
  Susquehanna River, West Branch, at Williamsport, Pa., 1895–1910.
  Susquehanna River, West Branch, at Allenwood, Pa., 1899–1902.
  Juniata River at Newport, Pa., 1899–1910.
  Broad Creek at Mill Green, Md., 1904–1909.
  Octoraro Creek at Rowlandsville, Md., 1896–1899.
  Deer Creek near Churchville, Md., 1904–1909.

GUNPOWDER RIVER BASIN.

Gunpowder Falls at Glencoe, Md., 1904–1909.
  Little Gunpowder Falls near Belair, Md., 1904–1909.

PATAPSCO RIVER BASIN.

Patapsco River at Woodstock, Md., 1896–1909.

PATUXENT RIVER BASIN.

Patuxent River at Laurel, Md., 1896–1898.

POTOMAC RIVER BASIN.

Potomac River, North Branch (head of Potomac River), at Piedmont, W. Va., 1899–1906.
Potomac River, North Branch, at Cumberland, Md., 1894–1897.
Potomac River at Great Cacapon, W. Va., 1894–1896.
Potomac River at Point of Rocks, Md., 1895–1910.
- Savage River at Bloomington, Md., 1905–6.
- Georges Creek at Westernport, Md., 1905–6.
- Wills Creek near Cumberland, Md., 1905–6.
- Potomac River, South Branch, near Springfield, W. Va., 1894–1896, 1899–1906.
- Opequan Creek near Martinsburg, W. Va., 1905–6.
- Tuscarora Creek at Martinsburg, W. Va., 1905.
- Antietam Creek near Sharpsburg, Md., 1897–1905.
- South River at Basic City, Va., 1905–6.
- South River at Port Republic, Va., 1895–1899.
- Shenandoah River, South Fork, near Front Royal, Va., 1899–1906.
- Shenandoah River at Millville, W. Va., 1895–1909.
  - North River at Port Republic, Va., 1895–1899.
    - Lewis Creek near Staunton, Va., 1905–6.
    - Cooks Creek at Mount Crawford, Va., 1905–6.
  - Elk Run at Elkton, Va., 1905–6.
  - Hawksbill Creek near Luray, Va., 1905–6.
  - Shenandoah River, North Fork, near Riverton, Va., 1899–1906.
    - Passage Creek at Buckton, Va., 1905–6.
- Monocacy River near Frederick, Md., 1896–1910.
- Goose Creek near Leesburg, Va., 1909–10.
- Rock Creek at Zoological Park, D. C., 1897–1900.
- Rock Creek at Lyons Mill, D. C., 1892–1894.

RAPPAHANNOCK RIVER BASIN.

Rappahannock River near Fredericksburg, Va., 1907–1910.

ST. JOHN RIVER.

GENERAL FEATURES OF AREA DRAINED.

St. John River drains the largest basin between St. Lawrence and Susquehanna rivers. Its extreme headwaters lie in the mountainous region between Maine and Canada, adjacent to those of the Penobscot. From the junction of the northwest and southwest branches, where the river first takes its name, to its junction with St. Francis River, a distance of 90 miles, its course is in general northeastward and lies wholly in Maine, although a portion of the tributary drainage area lies wholly in Canada. In this distance it receives Allagash River, its second largest tributary. From its junction with the St. Francis the St. John flows eastward, forming the northern boundary

of Maine for 70 miles and receiving in this stretch two important tributaries—Fish River, from the south, at Fort Kent, and Madawaska River, from the north, at Madawaska. At the point where the St. John leaves the State line its drainage area measures 8,200 square miles. Beyond this point it flows southward and receives the waters of Aroostook, Presque Isle, and Meduxnekeag rivers, the basins of which are almost entirely in Maine. From source to mouth its length is about 450 miles, and its total drainage area measures about 26,000 square miles.

In the eastern or lower portion of the basin the country is almost level near the river, but at a distance from the stream it becomes undulating and moderately hilly, finally subsiding and merging into the flat country bordering Aroostook River. Above the mouths of St. Francis and Allagash rivers the aspect of the basin is diversified by highlands.

The basin of the St. John is higher than that of any other river in the State, but as its elevation is fairly uniform the fall of the stream and the opportunities for the development of water power are less than on the other great rivers. Allagash River, which drains, exclusive of Chamberlain Lake drainage, 1,240 square miles of entirely wild and forest country, has considerable fall and affords excellent storage facilities, all unutilized.

The area as a whole is well forested. Large tracts have never been touched by the ax, and other portions have been lumbered for pine only. Probably 90 per cent of the whole basin tributary to the St. John at the eastern boundary of Maine is in forest.

The prevailing rocks in the eastern part of the area are limestones and slate, with patches of sandstone, coarse rock, and granite. Clays and slates are found over about 75 per cent of the total area.

According to the Maine State Water Storage Commission [1] the ponds and lakes in the St. John Basin have an aggregate area of 227 square miles, the largest of these lakes being tributary to Allagash and Fish rivers. On some of the lakes rough timber crib dams are used to store water for log driving, but no attempt is made to store water after the driving season is over. Previous to 1845 a canal was cut from Telos Lake, in the Allagash basin, to Webster Lake, in the Penobscot basin, and a dam was constructed between Chamberlain and Eagle lakes. In this way Chamberlain Lake, with its drainage area of 270 square miles, was rendered in part tributary to the Penobscot. This diversion continues at the present time. Its general effect is to supply most of the water to the Penobscot during the log-driving season, but after the gates at the dams are opened more water flows toward the St. John, as the Chamberlain dam gate sills are 0.6 foot lower than those at Telos Lake.

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[1] Second Ann. Rept. Maine State Water Storage Commission.

Precipitation records in the basin of the St. John are very meager, but from the best information available it seems probable that the mean annual rainfall is not over 30 to 35 inches.

The river and its tributaries are completely frozen over during the winter season, which usually extends from the 1st of November until after the middle of April, and provides a large amount of snow storage.

ST. JOHN RIVER NEAR DICKEY, MAINE.

This station, which was established July 5, 1910, is located near Dickey post office, Maine, on the farm of L. V. Henderson, 2 miles above the mouth of Allagash River and three-fourths of a mile below the mouth of Little Black River.

A rod gage is used. Gage heights are given as elevations above mean sea level.

Discharge measurements were made from a boat and by wading at a point 32½ feet below the gage.

The channel is composed of gravel and small bowlders. The banks are high and not liable to overflow.

The station was established and the discharge records have been furnished by the International Commission, River St. John.

Discharge measurements of St. John River near Dickey, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 18[a]	Douglas L. McLean[b]	421	1,028	587.02	2,471
July 5[c]	do	395	539	586.01	1,146
18[c]	do	295	382	585.68	495
22[c]	do	295	343	585.46	388
Sept. 7[c]	do	305	409	585.63	511

[a] Made at Dickey Ferry, about 2,000 feet above L. V. Henderson's farm.
[b] Measurements made under direction of International Commission, River St. John.
[c] Made by wading at L. V. Henderson's farm.

Daily gage height, in feet, and discharge, in second-feet, of St. John River near Dickey, Maine, for 1910.

Day.	July.		August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	587.3	2,640	585.5	410	585.6	470	588.1	4,220	.....	.....
2	.....	.....	587.1	2,300	585.4	350	585.6	470	587.9	3,790	.....	.....
3	.....	.....	586.9	1,980	585.4	350	585.6	470	587.	3,380	.....	.....
4	.....	.....	586.7	1,680	585.4	350	.....	470	587.0	2,140	.....	.....
5	586.2	1,020	587.5	3,000	585.4	350	585.6	470	587.1	2,300	.....	.....
6	586.1	910	587.5	3,000	585.5	410	585.7	540	588.1	4,220	.....	.....
7	586.2	1,020	587.1	2,300	585.6	470	585.9	710	589.1	6,900	.....	.....
8	586.2	1,020	587.0	2,140	586.4	350	586.2	1,020	588.8	6,020	.....	.....
9	586.1	910	586.9	1,980	587.9	3,790	586.2	1,020	588.3	4,690	.....	.....
10	586.0	810	586.5	1,400	588.1	4,220	586.9	1,980	587.7	3,380	.....	.....
11	585.9	710	586.5	1,400	587.6	3,190	587.7	3,380	587.4	2,820	.....	.....
12	585.9	710	587.0	2,140	587.2	2,470	587.2	2,470	587.1	2,300	.....	.....
13	585.8	620	587.4	2,820	587.0	2,140	587.0	2,140	587.0	2,140	.....	.....
14	585.8	620	587.7	3,380	586.7	1,680	586.3	1,140	586.7	1,680	.....	.....
15	585.7	540	587.2	2,470	586.5	1,400	586.2	1,020	586.6	1,540	.....	.....
16	585.7	540	586.7	1,680	586.5	1,400	586.1	910	586.4	1,270	.....	.....
17	585.7	540	586.3	1,140	586.3	1,140	586.1	910	586.3	1,140	.....	.....
18	585.6	470	586.1	910	586.1	910	586.2	1,020	586.2	1,020	.....	.....
19	585.5	410	586.2	1,020	586.0	810	586.1	910	586.2	1,020	.....	.....
20	585.4	350	586.4	1,270	585.9	710	586.3	1,140	586.2	1,020	.....	.....
21	585.4	350	586.4	1,270	585.7	540	586.3	1,140	586.1	910	.....	.....
22	585.5	410	586.2	1,020	585.6	470	586.2	1,020	586.1	910	.....	.....
23	585.6	470	586.0	810	585.5	410	586.2	1,020	586.0	810	.....	.....
24	585.8	620	585.9	710	585.5	410	586.1	910	585.9	710	.....	.....
25	586.1	910	585.8	620	585.5	410	586.3	1,140	.....	.....	.....	.....
26	586.3	1,140	585.7	540	585.5	410	586.3	1,140	.....	.....	.....	.....
27	586.6	1,540	585.7	540	585.5	410	586.9	1,980	.....	.....	.....	.....
28	586.8	1,830	585.7	540	585.5	410	587.3	2,640	.....	.....	.....	.....
29	587.6	3,190	585.6	470	585.6	470	587.4	2,820	.....	.....	.....	.....
30	587.7	3,380	585.6	470	585.6	470	588.0	4,000	.....	.....	.....	.....
31	587.7	3,380	585.5	410	.....	.....	587.7	3,380	.....	.....	.....	.....

NOTE.—Daily discharge obtained from a discharge rating curve which is fairly well defined.

Monthly discharge of St. John River near Dickey, Maine, for 1910.

[Drainage area, 2,820 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
June	.....	.....	.....	.....	.....	
July 5–31	3,380	350	1,050	0.372	0.37	B.
August	3,380	410	1,550	.550	.63	B.
September	4,220	350	1,040	.369	.41	B.
October	4,000	470	1,410	.500	.58	B.
Nov. 1–24	6,900	710	2,510	.890	.79	B.
December	.....	.....	.....	.....	.....	

ST. JOHN RIVER AT FORT KENT, MAINE.

This station, which is located at the footbridge that crosses the St. John near Fort Kent post office a short distance above the confluence of Fish River with the St. John, was established October 13, 1905. It is about 15 miles below the mouth of St. Francis River and

about 50 miles above Grand Falls, which is an important undeveloped power. Many power sites exist along the river.

Discharge measurements are made from the footbridge. The inclined staff gage is attached to a pier of the bridge. Its datum has remained the same during the maintenance of the station. During the winter months the discharge is affected by ice. The discharge is also at times affected by log jams, which form in the river in the vicinity of the station, especially on the bridge piers.

Conditions for obtaining accurate free-flow results are fair, and a good discharge rating curve has been developed.

The bed of the river is of gravel and rock and is probably permanent. Both banks are high and not subject to overflow except in extreme freshets.

The International Commission, River St. John, is especially interested in the work at this station at the present time in connection with investigations of the International control of St. John River.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of St. John River at Fort Kent, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 20[a]	F. E Pressey	645	2,100	6.69	1,140
May 3	do	689	5,490	10.47	25,100
June 10	W. E. Parsons	666	3,530	7.00	12,000
June 22	do	647	2,080	4.90	4,640

[a] Measurement made under ice conditions. Thickness of ice, 1.47 feet. The measurement was also much affected by anchor ice.

Daily gage height, in feet, of St. John River at Fort Kent, Maine, for 1910.

[Alice M. Currie. observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	.....	.....	7.05	3.95	4.75	3.2	3.0	4.5	3.3
2	.....	.....	.....	.....	10.75	8.1	3.8	5.0	3.2	3.0	4.5	3.3
3	.....	.....	.....	.....	10.55	8.65	.....	4.8	3.1	3.0	4.5	3.3
4	.....	.....	.....	.....	11.15	8.25	.....	4.45	3.1	3.0	4.85	.....
5	.....	6.4	5.7	9.5	11.35	.....	3.65	4.4	3.1	3.0	5.9	4.1
6	.....	.....	.....	9.25	11.4	6.7	3.55	4.55	3.1	3.15	6.85	4.3
7	.....	.....	.....	9.65	11.4	7.15	3.5	4.7	3.4	3.55	7.75	4.5
8	.....	.....	.....	11.4	.....	7.15	3.5	4.55	3.7	4.0	7.9	.....
9	.....	.....	.....	12.05	9.45	7.0	3.45	4.35	4.6	4.4	7.6	.....
10	.....	.....	.....	.....	9.1	7.0	.....	4.15	5.2	4.5	7.1	.....
11	.....	.....	.....	12.25	8.75	6.9	3.35	3.95	5.5	4.45	5.8	.....
12	.....	6.2	5.8	11.3	8.5	.....	3.25	3.95	5.35	4.15	5.0	.....
13	.....	.....	.....	10.55	8.2	6.5	3.2	4.05	5.2	3.85	.....	.....
14	6.7	.....	.....	9.9	7.85	6.45	3.1	4.25	4.85	3.65	4.75	.....
15	.....	.....	.....	9.15	.....	6.25	3.1	4.55	4.6	3.5	4.45	.....
16	.....	.....	.....	8.5	7.15	5.95	3.0	4.3	4.1	3.4	4.35	.....
17	.....	.....	.....	.....	6.95	5.75	.....	3.95	3.9	3.25	4.2	4.1
18	.....	.....	.....	8.4	6.65	5.6	3.35	3.75	.....	3.35	4.05	.....
19	.....	6.0	5.9	8.6	6.25	.....	3.4	3.7	4.1	3.65	4.0	.....
20	6.7	.....	.....	10.05	6.05	5.1	3.3	3.75	4.05	3.75	.....	.....

Daily gage height, in feet, of St. John River, at Fort Kent, Maine, for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	.....	.....	.....	12.1	5.85	4.9	3.3	3.75	3.85	3.55	3.9	.....
22	.....	.....	.....	13.7	.....	4.95	3.4	3.65	3.7	3.5	3.8	.....
23	.....	.....	.....	15.6	5.4	4.9	3.4	3.6	3.4	3.7	3.75	.....
24	.....	.....	.....	16.65	5.05	4.9	3.4	3.5	3.2	3.65	3.65	4.6
25	.....	.....	.....	16.15	5.25	4.9	3.55	3.6	3.0	3.5	3.55	.....
26	.....	5.8	7.2	15.65	5.7	.....	3.8	3.5	3.0	3.5	3.5	.....
27	.....	.....	.....	15.35	6.1	4.65	3.95	3.4	3.0	3.85	.....	.....
28	.....	.....	.....	14.6	6.75	4.45	4.15	3.35	3.0	4.3	3.4	.....
29	.....	.....	.....	14.1	.....	4.15	4.3	3.3	3.0	4.4	3.4	.....
30	.....	.....	.....	13.1	6.35	3.95	4.45	3.25	3.0	.....	3.35	.....
31	7.3	.....	.....	.....	6.55	.....	.....	3.2	.....	4.5	.....	.....

NOTE.—Gage heights affected by the presence of ice from Jan. 1 to Apr. 4 and from Dec. 4 to 31. Gage heights were taken to water surface. The ice thickness during January to March varied from about 1.2 feet to 2.5 feet. The ice attained a thickness of about 1.3 feet during December.

From Sept. 1 to 10 the gage heights were computed from the records of the gage of the International Commission, River St. John, at Carron.

Daily discharge, in second-feet, of St. John River at Fort Kent, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	.....	35,000	11,900	2,420	4,240	1,270	1,060	3,610	1,390
2	.....	.....	.....	.....	28,600	16,200	2,140	4,900	1,270	1,060	3,610	1,390
3	.....	.....	.....	.....	27,600	18,600	2,060	4,370	1,160	1,060	3,610	1,390
4	.....	.....	.....	.....	30,700	16,900	1,970	3,490	1,160	1,060	4,500	.....
5	.....	.....	.....	22,500	31,700	13,700	1,890	3,370	1,160	1,060	7,660	.....
6	.....	.....	.....	21,400	32,000	10,500	1,740	3,740	1,160	1,220	11,100	.....
7	.....	.....	.....	23,200	32,000	12,300	1,660	4,110	1,520	1,740	14,700	.....
8	.....	.....	.....	32,000	27,200	12,300	1,660	3,740	1,970	2,510	15,400	.....
9	.....	.....	.....	35,500	22,300	11,700	1,590	3,260	3,860	3,370	14,100	.....
10	.....	.....	.....	36,000	20,700	11,700	1,520	2,820	5,470	3,610	12,100	.....
11	.....	.....	.....	36,600	19,100	11,300	1,460	2,420	6,380	3,490	7,330	.....
12	.....	.....	.....	31,500	18,000	10,500	1,330	2,420	5,920	2,820	4,900	.....
13	.....	.....	.....	27,600	16,700	9,770	1,270	2,610	5,470	2,230	4,570	.....
14	.....	.....	.....	24,400	15,200	9,580	1,160	3,030	4,500	1,890	4,240	.....
15	.....	.....	.....	20,900	13,800	8,860	1,160	3,740	3,860	1,660	3,490	.....
16	.....	.....	.....	18,000	12,300	7,830	1,060	3,140	2,710	1,520	3,260	.....
17	.....	.....	.....	17,800	11,500	7,170	1,260	2,420	2,320	1,330	2,920	.....
18	.....	.....	.....	17,500	10,300	6,690	1,460	2,060	2,520	1,460	2,610	.....
19	.....	.....	.....	18,400	8,860	5,940	1,520	1,970	2,710	1,890	2,510	.....
20	.....	.....	.....	25,100	8,170	5,180	1,390	2,060	2,610	2,060	2,420	.....
21	.....	.....	.....	35,800	7,500	4,630	1,390	2,060	2,230	1,740	2,320	.....
22	.....	.....	.....	44,900	6,780	4,760	1,520	1,890	1,970	1,660	2,140	.....
23	.....	.....	.....	56,600	6,070	4,630	1,520	1,810	1,520	1,970	2,060	.....
24	.....	.....	.....	63,300	5,040	4,630	1,520	1,660	1,270	1,890	1,890	.....
25	.....	.....	.....	60,100	5,620	4,630	1,740	1,810	1,060	1,660	1,740	.....
26	.....	.....	.....	56,900	7,010	4,300	2,140	1,660	1,060	1,660	1,660	.....
27	.....	.....	.....	55,000	8,340	3,980	2,420	1,520	1,060	2,230	1,590	.....
28	.....	.....	.....	50,300	10,700	3,490	2,820	1,460	1,060	3,140	1,520	.....
29	.....	.....	.....	47,300	9,960	2,820	3,140	1,390	1,060	3,370	1,520	.....
30	.....	.....	.....	41,400	9,220	2,420	3,490	1,330	1,060	3,490	1,460	.....
31	.....	.....	.....	.....	9,960	.....	3,860	1,270	.....	3,610	.....	.....

NOTE.—Daily discharge determined from a well-defined rating curve. The discharge for Sundays and for other days when the gage was not read estimated by means of gage-height records taken at other points by the International Commission, River St. John.

Monthly discharge of St. John River at Fort Kent, Maine, for 1910.

[Drainage area, 4,880 *a* square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	1,450	0.297	0.34	D.
February	.....	.....	1,200	.246	.26	D.
March	.....	.....	3,200	.656	.76	D.
April	63,300	.....	32,900	6.74	7.52	A.
May	35,000	5,040	16,400	3.36	3.87	A.
June	18,600	2,420	8,630	1.77	1.98	A.
July	3,860	1,060	1,850	.379	.44	A.
August	4,900	1,270	2,640	.541	.62	A.
September	6,380	1,060	2,410	.494	.55	A.
October	3,610	1,060	2,080	.426	.49	A.
November	15,400	1,460	4,880	1.00	1.12	A.
December	.....	.....	1,400	.287	.33	D.
The year	63,300	.....	6,570	1.35	18.28	

a Does not include Chamberlain Lake drainage area of 270 square miles. See description of drainage area, p. 28.

NOTE.—The mean discharge Apr. 1 to 4 estimated at 16,800 second-feet. Discharge determined for the winter months is based on one measurement made Jan. 20, with ice present and on climatological records. The discharge did not vary greatly during the month of January, February, or December, but increased considerably during the later part of March.

This table supersedes tables published in the first annual report of the Maine State Water Storage Commission.

ST. JOHN RIVER AT VAN BUREN, MAINE.

This station, which is located at the new international bridge at Van Buren, Maine, about 14 miles above Grand Falls, New Brunswick, was established May 4, 1908.

The gage heights during 1908–1910 were read on a vertical rod attached to the pier of the sawdust carrier of Hammonds mill, about 700 feet below the international bridge. The bridge gage is painted on the second pier (from the Van Buren side of the bridge); the zero of the gage is 407.69 feet above sea level. All gage readings for 1908–1910 have been reduced to the corresponding bridge gage readings.

Discharge measurements are made from bridge. No measurements were made in 1908–1910; the discharge has been computed from the 24 measurements made during 1911.

The control of the stream above the station for log driving probably does not materially affect the flow past the gage. The relation of gage height to discharge is affected by ice during the winter months, but an ice-rating curve has been developed.

The station is maintained by the International Commission, River St. John.

Daily gage height, in feet, of St. John River at Van Buren, Maine, for 1908–1910.

[J. N. Johnson, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1908.						1908.					
1	.....	427.6	415.2	411.0	410.6	16	431.4	417.0	413.0	411.8	.....
2	.....	428.2	414.8	410.8	410.6	17	430.6	418.0	412.6	411.8	.....
3	.....	427.0	414.6	410.8	410.6	18	430.6	419.6	412.4	412.0	.....
4	431.6	425.4	414.6	410.6	410.4	19	430.8	419.2	412.2	412.4	.....
5	431.2	424.0	414.2	410.6	.....	20	430.6	419.4	412.0	413.4	.....
6	431.0	422.8	414.2	410.6	.....	21	430.6	420.4	411.8	413.4	.....
7	430.6	421.6	414.2	410.8	.....	22	429.6	421.4	411.8	413.4	.....
8	430.6	420.4	414.2	411.2	.....	23	428.2	420.8	411.8	413.0	.....
9	430.8	420.2	414.6	411.4	.....	24	427.2	419.8	411.8	412.6	.....
10	431.2	419.4	414.8	411.6	.....	25	426.2	419.0	411.6	412.2	.....
11	430.4	418.8	414.2	411.2	.....	26	425.2	418.2	411.8	411.4	.....
12	430.2	418.2	414.0	411.2	.....	27	424.8	417.8	411.6	411.2	.....
13	430.4	418.0	413.8	411.2	.....	28	425.2	417.2	411.4	411.0	.....
14	430.4	417.6	413.4	411.6	.....	29	425.2	416.8	411.2	410.6	.....
15	430.8	417.0	413.4	411.8	.....	30	424.6	416.2	411.2	410.6	.....
						31	424.2	.....	411.4	410.6	.....

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.								
1	.....	420.9	413.1	413.1	414.5	426.5	413.2	415.4
2	.....	420.1	412.9	413.0	415.2	425.1	413.1	415.2
3	.....	419.3	412.9	412.4	416.1	423.1	413.3	415.1
4	.....	418.4	413.5	411.7	416.3	421.9	413.7	414.8
5	.....	417.8	413.8	411.3	415.7	420.7	414.6	414.4
6	.....	417.4	414.2	411.0	416.8	419.7	414.3	414.6
7	.....	415.8	414.7	410.8	417.6	418.9	414.1	414.4
8	.....	415.4	415.3	410.7	417.8	418.1	414.1	414.2
9	.....	414.8	415.3	410.8	417.1	417.5	414.0	413.8
10	427.9	414.5	415.4	411.4	416.2	416.7	413.8	413.5
11	430.5	414.2	414.7	412.4	415.8	416.2	413.5	413.3
12	433.5	413.8	413.9	413.7	415.4	415.8	413.3	413.3
13	434.9	413.5	414.1	413.6	415.1	415.4	413.7	415.9
14	434.5	413.1	414.3	413.1	414.6	415.0	414.3	.....
15	433.6	413.5	414.4	412.8	414.2	414.9	413.5	.....
16	432.8	413.3	413.9	412.4	413.9	414.8	413.5	.....
17	432.5	413.0	415.3	412.0	413.7	414.7	413.3	.....
18	432.2	413.0	416.0	412.0	413.3	414.5	413.1	.....
19	431.5	413.9	416.4	411.6	413.1	414.2	412.9	.....
20	431.1	416.3	416.3	411.4	412.9	414.0	412.8	.....
21	429.7	418.3	416.2	411.2	412.7	413.7	413.0	.....
22	428.6	417.5	416.6	411.0	412.6	413.6	413.2	.....
23	427.2	416.7	416.0	410.8	412.4	413.5	413.4	.....
24	426.8	415.9	415.2	410.5	412.1	413.7	413.5	.....
25	426.3	415.5	414.9	410.5	412.1	413.9	414.5	.....
26	425.5	414.8	414.7	410.9	412.0	414.1	414.7	.....
27	424.6	414.2	414.3	413.2	412.5	413.9	415.8	.....
28	423.6	413.9	413.9	415.8	414.4	413.7	415.8	.....
29	423.0	413.5	413.6	415.8	418.4	413.6	415.7	.....
30	422.2	413.3	413.4	416.5	425.7	413.5	415.7	.....
31	421.5	.....	413.2	415.3	.....	413.4	.....	.....

Daily gage height, in feet, of St. John River at Van Buren, Maine, for 1908–1910—Contd.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.								
1	.....	417.15	411.35	411.35	409.35	408.95	411.15	410.55
2	.....	418.15	411.35	411.55	409.15	408.75	410.95	410.55
3	.....	419.15	411.35	411.75	408.95	408.55	410.75	410.55
4	.....	418.95	410.75	411.35	408.95	409.15	410.55	410.35
5	.....	418.15	410.75	410.95	418.95	409.15	410.35	410.35
6	.....	417.35	410.95	410.75	408.75	409.35	410.55	410.55
7	424.55	416.95	410.95	410.75	409.35	409.55	412.75	410.75
8	423.55	417.35	410.75	411.15	409.95	409.75	413.95	410.95
9	422.75	417.15	410.55	410.95	410.55	409.95	413.95	410.75
10	422.35	416.95	410.55	410.75	410.95	410.15	413.35	410.75
11	421.95	416.55	410.35	409.75	411.35	410.55	412.75	410.75
12	421.35	416.15	410.15	409.95	411.75	410.15	412.55	410.75
13	420.55	416.35	410.15	410.15	411.85	409.75	412.15	410.55
14	420.15	416.35	410.15	410.55	411.35	409.55	411.95	410.55
15	419.35	415.75	409.95	410.95	410.75	409.55	411.75	410.55
16	418.75	415.35	410.15	410.95	410.55	409.55	411.45	410.55
17	418.35	414.95	410.15	410.35	410.55	409.35	411.35	410.55
18	417.75	414.55	410.15	409.95	409.75	409.35	411.15	410.55
19	417.35	414.15	410.15	409.95	409.55	409.35	410.95	410.35
20	416.95	413.75	409.95	410.15	409.35	409.35	410.75	410.35
21	416.75	413.55	409.75	409.95	409.15	409.35	410.55	410.35
22	416.35	413.35	409.55	409.95	409.15	409.55	410.35	410.35
23	416.15	413.15	409.95	409.75	409.15	409.55	410.35	410.55
24	415.55	412.95	409.15	409.75	409.15	409.35	410.35	410.55
25	414.95	412.75	409.95	409.75	408.95	409.55	410.35	410.55
26	415.35	412.75	410.15	409.55	408.95	409.55	410.35	410.55
27	415.55	412.55	410.35	409.55	409.15	410.15	410.35	410.55
28	417.35	412.35	410.55	409.35	408.95	410.55	410.15	410.55
29	417.75	411.95	410.55	409.15	408.95	410.95	410.35	410.75
30	417.35	411.55	410.55	408.95	408.95	411.15	410.35	410.95
31	416.95	.....	410.95	409.15	.....	411.35	.....	411.55

NOTE.—The relation of gage height to discharge was affected by ice from about Dec. 4 to 31, 1910.

Daily discharge, in second-feet, of St. John River at Van Buren, Maine, for 1908–1910.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1908.						1908.					
1	.....	78,800	17,600	6,260	5,330	16	106,000	23,800	11,300	8,220	.....
2	.....	82,900	16,400	5,790	5,330	17	100,000	27,600	10,300	8,220	.....
3	.....	74,800	15,800	5,790	5,330	18	100,000	34,200	9,740	8,720	.....
4	108,000	64,700	15,800	5,330	4,880	19	102,000	32,400	9,230	9,740	.....
5	105,000	56,500	14,600	5,330	.....	20	100,000	33,300	8,720	12,400	.....
6	103,000	49,900	14,600	5,330	.....	21	100,000	37,900	8,220	12,400	.....
7	100,000	43,700	14,600	5,790	.....	22	92,800	42,700	8,220	12,400	.....
8	100,000	37,900	14,600	6,740	.....	23	82,900	39,800	8,220	11,300	.....
9	102,000	36,900	15,800	7,230	.....	24	76,100	35,100	8,220	10,300	.....
10	105,000	33,300	16,400	7,720	.....	25	69,700	31,600	7,720	9,230	.....
11	106,000	30,800	14,600	6,740	.....	26	63,500	28,300	8,220	7,230	.....
12	97,300	28,300	14,000	6,740	.....	27	61,100	26,800	7,720	6,740	.....
13	98,800	27,600	13,500	6,740	.....	28	63,500	24,500	7,230	6,260	.....
14	98,800	26,000	12,400	7,720	.....	29	63,500	23,000	6,740	5,330	.....
15	102,000	23,800	12,400	8,220	.....	30	60,000	20,900	6,740	5,330	.....
						31	57,600	.....	7,230	5,330	.....

NOTE.—Daily discharge for 1908 obtained from a well-defined rating curve based on measurements made during 1911.

Daily discharge, in second-feet, of St. John River at Van Buren, Maine, for 1908-1910—Continued.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.								
1	.....	40,300	11,600	11,600	15,500	71,600	11,800	18,200
2	.....	36,500	11,000	11,300	17,600	62,900	11,600	17,600
3	.....	32,900	11,000	9,740	20,600	51,500	12,100	17,300
4	.....	29,100	12,600	7,970	21,300	45,200	13,200	16,400
5	.....	26,800	13,500	6,980	19,200	39,300	15,800	15,200
6	.....	25,200	14,600	6,260	23,000	34,600	14,900	15,800
7	.....	19,600	16,100	5,790	26,000	31,200	14,300	15,200
8	.....	18,200	17,900	5,560	26,800	27,900	14,300	14,600
9	.....	16,400	17,900	5,790	24,100	25,600	14,000	13,500
10	80,800	15,500	18,200	7,230	20,900	22,700	13,500	12,600
11	99,600	14,600	16,100	9,740	19,600	20,900	12,600	12,100
12	123,000	13,500	13,800	13,200	18,200	19,600	12,100	12,100
13	134,000	12,600	14,300	12,900	17,300	18,200	13,200	.....
14	131,000	11,600	14,900	11,600	15,800	17,000	14,900	.....
15	124,000	12,600	15,200	10,800	14,600	16,700	12,600	.....
16	117,000	12,100	13,800	9,740	13,800	16,400	12,600	.....
17	115,000	11,300	17,900	8,720	13,200	16,100	12,100	.....
18	113,000	11,300	20,200	8,720	12,100	15,500	11,600	.....
19	107,000	13,800	21,600	7,720	11,600	14,600	11,000	.....
20	104,000	21,300	21,300	7,230	11,000	14,000	10,800	.....
21	93,600	28,700	20,900	6,740	10,500	13,200	11,300	.....
22	85,700	25,600	22,300	6,260	10,300	12,900	11,800	.....
23	76,100	22,700	20,200	5,790	9,740	12,600	12,400	.....
24	73,500	19,900	17,600	5,100	8,980	13,200	12,600	.....
25	70,300	18,600	16,700	5,100	8,980	13,800	15,500	.....
26	65,300	16,400	16,100	6,020	8,720	14,300	16,100	.....
27	60,000	14,600	14,900	11,800	10,000	13,800	19,600	.....
28	54,300	13,800	13,800	19,600	15,200	13,200	19,600	.....
29	51,000	12,600	12,900	19,600	29,100	12,900	19,200	.....
30	46,700	12,100	12,400	22,000	66,500	12,600	19,200	.....
31	43,200	.....	11,800	17,900	.....	12,400	.....	.....

NOTE.—Daily discharge for 1909 obtained from a well-defined rating curve based on measurements made during 1911.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.								
1	.....	24,300	7,110	7,110	2,650	1,910	6,620	5,220
2	.....	28,100	7,110	7,600	2,270	1,570	6,140	5,220
3	.....	32,200	7,110	8,100	1,910	1,250	5,680	5,220
4	.....	31,400	5,680	7,110	1,910	2,270	5,220	4,000
5	.....	28,100	5,680	6,140	1,910	2,270	4,770	3,500
6	.....	25,000	6,140	5,680	1,570	2,650	5,220	3,000
7	59,700	23,600	6,140	5,680	2,650	3,060	10,600	2,000
8	54,000	25,000	5,680	6,620	3,900	3,480	13,900	1,450
9	49,600	24,300	5,220	6,140	5,220	3,900	13,900	1,250
10	47,500	23,600	5,220	5,680	6,140	4,330	12,200	1,250
11	45,400	22,100	4,770	3,480	7,110	5,220	10,600	1,250
12	42,500	20,800	4,330	3,900	8,100	4,330	10,100	1,250
13	38,600	21,400	4,330	4,330	8,340	3,480	9,100	1,060
14	36,700	21,400	4,330	5,220	7,110	3,060	8,600	1,060
15	33,100	19,400	3,900	6,140	5,680	3,060	8,100	1,060
16	30,600	18,100	4,330	6,140	5,220	3,060	7,350	1,060
17	28,900	16,800	4,330	4,770	5,220	2,650	7,110	1,060
18	26,600	15,600	4,330	3,900	3,480	2,650	6,620	1,060
19	25,000	14,500	4,330	3,900	3,060	2,650	6,140	875
20	23,600	13,300	3,900	4,330	2,650	2,650	5,680	875
21	22,800	12,800	3,480	3,900	2,270	2,650	5,220	875
22	21,400	12,200	3,060	3,900	2,270	3,060	4,770	875
23	20,800	11,700	3,900	3,480	2,270	3,060	4,770	1,060
24	18,700	11,200	2,270	3,480	2,270	2,650	4,770	1,060
25	16,800	10,600	3,900	3,480	1,910	3,060	4,770	1,060
26	18,100	10,600	4,330	3,060	1,910	3,060	4,770	1,060
27	18,700	10,100	4,770	3,060	2,270	4,330	4,770	1,060
28	25,000	9,610	5,220	2,650	1,910	5,220	4,330	1,060
29	26,600	8,600	5,220	2,270	1,910	6,140	4,770	1,250
30	25,000	7,600	5,220	1,910	1,910	6,620	4,770	1,450
31	23,600	.....	6,140	2,270	.....	7,110	.....	2,120

NOTE.—For 1910: Daily discharge May 7 to Dec. 3 obtained from a well-defined rating curve which is based on measurements made during 1911; daily discharge during the ice period, except Dec. 4-7, obtained from a well-defined rating curve based on measurements made under ice cover; Dec. 4-7 estimated.

Monthly discharge of St. John River at Van Buren, Maine, for 1908–1910.

[Drainage area, 8,270 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1908.						
May 4–31	108,000	57,600	90,200	10.9	11.35	B.
June	82,900	20,900	38,600	4.67	5.21	A.
July	17,600	6,740	11,500	1.39	1.60	A.
August	12,400	5,330	7,630	.923	1.06	A.
1909.						
May 10–31	134,000	43,200	89,500	10.8	8.84	B.
June	40,300	11,300	19,300	2.33	2.60	A.
July	22,300	11,000	15,900	1.92	2.21	A.
August	22,000	5,100	9,820	1.19	1.37	A.
September	66,500	8,720	18,000	2.18	2.43	A.
October	71,600	12,400	23,400	2.83	3.26	A.
November	19,600	10,800	13,900	1.68	1.87	A.
December 1–12	18,200	12,100	15,000	1.81	.81	A.
1910.						
May 7–31	59,700	16,800	31,200	3.77	3.50	A.
June	32,200	7,600	18,500	2.24	2.50	A.
July	7,110	2,270	4,890	.591	.68	A.
August	8,100	1,910	4,690	.567	.65	A.
September	8,340	1,570	3,570	.432	.48	A.
October	7,110	1,250	3,430	.415	.48	A.
November	13,900	4,330	7,050	.852	.95	A.
December	5,220	875	1,800	.218	.25	B.

ALLAGASH RIVER NEAR ALLAGASH, MAINE.

This station, which is located 2 miles below Dickey post office, 105 feet below the ferry crossing Allagash River, and 1,500 feet above the confluence of Allagash and St. John rivers, was established July 21, 1910, by the International Commission, River St. John, by whom the discharge records were furnished.

A rod gage is used. Gage heights are given as elevations above mean sea level.

The banks are high and not liable to overflow. The bed of the river is composed of gravel and small bowlders.

Discharge measurements are made from a boat and by wading at a point 35 feet above the gage.

Dams at Long, Ross, and Musquacook lakes may at times hold water back and for a given gage height may cause a much lower flow at the station than the natural minimum flow of the stream

A discharge rating curve has been developed which nearly covers the range in the stage of the river for 1910.

Discharge measurements of Allagash River near Allagash, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 17[a]	Douglas L. McLean[b]	288	835	583.36	2,208
July 4[a]	do	180	370	581.53	258
16[c]	do	247	511	582.20	661
21[d]	do	108.5	165.5	581.67	259

[a] Made 70 feet below ferry at gaging station.
[b] Measurements made under direction of International Commission, River St. John.
[c] Gage height referred to a temporary gage and somewhat uncertain.
[d] Made by wading about 1½ miles above ferry at gaging station.

Daily gage height, in feet, and discharge, in second-feet, of Allagash River near Allagash, Maine, for 1910.

Day.	July.		August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	[a] 200	581.9	420	581.8	355	581.9	420	582.3	740	.....	.....
2	.....	[a] 200	581.9	420	581.9	420	581.9	420	582.5	935	.....	.....
3	581.5	200	582.0	490	581.9	420	581.9	420	582.5	935	.....	.....
4	581.5	200	582.0	490	582.0	490	581.8	355	582.5	935	.....	.....
5	581.9	420	582.0	490	582.0	490	581.8	355	582.4	835	.....	.....
6	581.9	420	582.0	490	581.9	420	581.7	295	582.3	740	.....	.....
7	581.5	200	582.0	490	581.9	420	581.7	295	582.1	565	.....	.....
8	581.5	200	581.9	420	582.0	490	581.8	355	581.7	295	.....	.....
9	581.5	200	581.8	355	582.4	835	581.9	420	581.7	295	.....	.....
10	581.4	165	581.8	355	582.4	835	581.9	420	581.7	295	.....	.....
11	581.4	165	581.8	355	583.6	2,410	581.8	355	581.7	295	.....	.....
12	582.7	1,160	581.8	355	584.1	3,230	581.8	355	581.7	295	.....	.....
13	582.7	1,160	581.9	420	583.5	2,260	581.8	355	581.7	295	.....	.....
14	582.7	1,160	581.9	420	583.1	1,660	581.7	295	581.7	295	.....	.....
15	582.4	835	582.0	490	582.9	1,400	581.7	295	581.7	295	.....	.....
16	582.2	650	581.9	420	582.8	1,280	581.7	295	581.7	295	.....	.....
17	582.4	835	581.8	355	582.7	1,160	581.7	295	581.8	355	.....	.....
18	581.8	355	581.7	295	582.5	935	581.6	245	581.8	355	.....	.....
19	581.7	295	581.7	295	582.5	935	581.6	245	581.8	355	.....	.....
20	581.7	295	581.7	295	582.5	935	581.6	245	581.8	355	.....	.....
21	581.6	245	581.7	295	582.4	835	581.6	245	581.7	295	.....	.....
22	581.6	245	581.7	295	582.3	740	581.5	200	.....	.....	.....	.....
23	581.7	295	581.9	420	582.3	740	581.5	200	.....	.....	.....	.....
24	582.0	490	582.3	740	582.2	650	581.6	245	.....	.....	.....	.....
25	581.9	420	582.2	650	582.4	835	581.7	295	.....	.....	.....	.....
26	582.0	490	582.1	565	582.0	490	581.8	355	.....	.....	.....	.....
27	581.9	420	582.0	490	582.0	490	581.9	420	.....	.....	.....	.....
28	581.9	420	582.0	490	582.0	490	582.0	490	.....	.....	.....	.....
29	581.9	420	581.9	420	582.0	490	582.1	565	.....	.....	.....	.....
30	581.9	420	581.8	355	581.9	420	582.2	650	.....	.....	.....	.....
31	581.9	420	581.8	355	.....	.....	582.2	650	.....	.....	.....	.....

[a] Estimated.

NOTE.—The gage heights from July 3 to 15 and 17 to 20 are estimated from the record of the temporary gage at Michaud farm, about 15 miles above the mouth of the river, used by the International Commission, River St. John, for river profile work.

Daily discharge obtained from a discharge rating curve fairly well defined between 500 and 7,000 second-feet. Below about 500 second-feet it is not well defined.

Monthly discharge of Allagash River near Allagash, Maine, for 1910.

[Drainage area, 1,240 square miles.]

Month	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
July	1,160	165	439	0.354	0.41	B.
August	740	295	426	.344	.40	B.
September	3,230	355	919	.741	.83	B.
October	650	200	356	.287	.33	B.
November 1-21	935	295	479	.386	.30	B.
December						

ST. FRANCIS RIVER NEAR ST. FRANCIS, MAINE.

St. Francis River rises in Lake St. Francis in Temiscouata County, Quebec, and flows southeastward, passing through Dohenagamook and Glazier lakes and uniting with St. John River at St. Francis, Aroostook County, Maine.

The gaging station, which is located 1 mile above the mouth of the river, 1½ miles from St. Francis, Maine, 4 miles from Conners, New Brunswick, and 3 miles below Glazier Lake, was established May 11, 1910, by the International Commission, River St. John, by whom the records are furnished.

The drainage area is about 560 square miles.

Three gages were maintained by the International Commission, River St. John, on this river during 1910:

No. 1, a permanent rod gage, 1 mile above the mouth of the river. The zero of this gage is 528.84 feet above mean sea level. An observer for daily readings could not be found during 1910.

No. 2 (Cooper gage), a temporary gage, located 1½ miles above gage No. 1, and half a mile below Fall Brook at the farm of Richard Cooper. This gage was read from July 25 to November 30, 1910, as recorded in the following table.

No. 3, a temporary gage, located at the outlet of Glazier Lake, 3 miles above the permanent gage. This gage was read daily from May 11 to November 30, 1910.

Measurements are made from a canoe or by wading 10 feet above the permanent gage.

The discharge measurements for 1910 here published are referred to gage No. 3. Temporary gages 2 and 3 were discontinued on November 30, 1910. During 1911 gage readings were recorded from the permanent gage. The gage heights at gage No. 3 record the rise and fall of Glazier Lake as well as the fluctuations of the river, and for this reason the computations of daily and monthly discharge are somewhat uncertain.

Discharge measurements of St. Francis River near St. Francis, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 15	Douglas L. McLean	110	376	5.1	1,188
July 1	do	100	237	4.0	461
14	do	96	205	3.7	336
24	do	94	179	3.5	216
Oct. 20	do	94	174	3.4	219
Nov. 27	do	96	207	3.7	331

NOTE.—Measurements made under direction of International Commission, River St. John, at the permanent gage 1 mile above the mouth of St. Francis River. Gage heights refer to temporary gage No. 3.

Daily gage height, in feet, referred to gage No. 2, of St. Francis River near St. Francis, Maine, for 1910.

[Richard Cooper, observer.]

Day.	July.	Aug.	Sept.	Oct.	Nov.	Day.	July.	Aug.	Sept.	Oct.	Nov.
1		1.6	0.7	0.6	1.3	16		1.2	1.1	1.0	2.0
2		1.7	.7	.6	1.3	17		1.1	1.0	1.0	1.9
3		1.7	.6	.6	1.2	18		1.1	1.0	1.0	1.9
4		1.6	.6	.6	1.2	19		1.2	.9	1.0	1.8
5		1.7	.6	.6	1.2	20		1.1	.8	1.0	1.7
6		1.7	.6	.7	1.3	21		1.1	.8	1.0	1.6
7		1.6	.7	.7	1.5	22		1.0	.8	1.0	1.6
8		1.5	.7	.7	1.9	23		1.0	.8	1.0	1.5
9		1.5	.8	.7	2.0	24		1.0	.7	1.0	1.5
10		1.4	.9	.7	2.1	25	1.1	.9	.7	1.0	1.4
11		1.4	.9	.9	2.2	26	1.1	.9	.7	1.0	1.3
12		1.4	1.0	1.0	2.2	27	1.2	.9	.7	1.1	1.3
13		1.3	1.1	1.0	2.2	28	1.3	.9	.6	1.2	1.4
14		1.3	1.1	1.0	2.1	29	1.4	.8	.6	1.3	1.4
15		1.3	1.1	1.0	2.1	30	1.4	.8	.6	1.3	1.4
						31	1.5	.7		1.3	

NOTE.—Gage heights taken at the Cooper gage, ½ mile below Fall Brook and 1½ miles above the permanent gage. Readings on this gage were discontinued Nov. 30, 1910.

Daily gage height, in feet, referred to gage No. 3, of St. Francis River near St. Francis, Maine, for 1910.

[Mrs. Charles Morris, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		6.2	4.0	4.0	3.2	3.1	3.7
2		6.2	3.9	4.0	3.2	3.1	3.7
3		6.2	3.9	4.1	3.1	3.1	3.6
4		6.2	3.9	4.1	3.1	3.1	3.6
5		6.1	3.9	4.0	3.1	3.1	3.6
6		6.1	3.9	4.0	3.1	3.1	3.7
7		5.9	3.9	4.0	3.2	3.1	3.9
8		5.7	4.0	4.0	3.2	3.2	4.0
9		5.6	4.0	3.9	3.2	3.2	4.3
10		5.5	3.9	3.8	3.2	3.2	4.5
11	7.5	5.5	3.9	3.8	3.4	3.2	4.6
12	7.5	5.4	3.8	3.8	3.4	3.3	4.6
13	7.3	5.3	3.7	3.7	3.4	3.4	4.5
14	7.0	5.2	3.7	3.7	3.5	3.4	4.4
15	6.9	5.1	3.7	3.6	3.5	3.4	4.3
16	6.5	5.1	3.7	3.6	3.5	3.4	4.3
17	6.3	5.0	3.6	3.5	3.4	3.4	4.2
18	6.0	4.9	3.6	3.5	3.4	3.4	4.2
19	6.0	4.8	3.6	3.6	3.3	3.4	4.1
20	6.3	4.7	3.6	3.6	3.3	3.4	4.1

Daily gage height, in feet, referred to gage No. 3, of St. Francis River near St. Francis, Maine, for 1910—Continued.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
21	6.5	4.6	3.5	3.5	3.2	3.4	4.0
22	6.2	4.5	3.5	3.5	3.2	3.4	4.0
23	5.9	4.4	3.5	3.5	3.2	3.4	3.9
24	5.8	4.4	3.5	3.4	3.2	3.4	3.8
25	5.5	4.3	3.5	3.4	3.2	3.4	3.8
26	5.5	4.2	3.6	3.4	3.2	3.4	3.8
27	5.5	4.2	3.6	3.3	3.2	3.5	3.7
28	5.5	4.1	3.7	3.3	3.1	3.5	3.7
29	6.5	4.1	3.8	3.3	3.1	3.6	3.7
30	6.0	4.0	3.8	3.3	3.1	3.6	3.7
31	6.2	.....	3.9	3.2	.....	3.7	.....

NOTE.—Read on the gage at the outlet of Glazier Lake, 3 miles above the permanent gage. The gage heights record the rise and fall of the lake and probably do not represent fully the true fluctuations of the river.

Daily discharge, in second-feet, of St. Francis River near St. Francis, Maine, for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2,070	460	460	145	120	320
2	.....	2,070	409	460	145	120	320
3	.....	2,070	409	516	120	120	279
4	.....	2,070	409	516	120	120	279
5	.....	1,990	409	460	120	120	279
6	.....	1,990	409	460	120	120	320
7	.....	1,820	409	460	145	120	409
8	.....	1,660	460	460	145	145	460
9	.....	1,580	460	409	145	145	632
10	.....	1,500	409	361	145	145	762
11	3,300	1,500	409	361	207	145	830
12	3,300	1,420	361	361	207	175	830
13	3,100	1,340	320	320	207	207	762
14	2,800	1,260	320	320	240	207	696
15	2,710	1,190	320	279	240	207	632
16	2,350	1,190	320	279	240	207	632
17	2,170	1,110	279	240	207	207	572
18	1,900	1,040	279	240	207	207	572
19	1,900	970	279	279	175	207	516
20	2,170	900	279	279	175	207	516
21	2,350	830	240	240	145	207	460
22	2,080	762	240	240	145	207	460
23	1,820	696	240	240	145	207	409
24	1,740	696	240	207	145	207	361
25	1,500	632	240	207	145	207	361
26	1,500	572	279	207	145	207	361
27	1,500	572	279	175	145	240	320
28	1,500	516	320	175	120	240	320
29	2,350	516	361	175	120	279	320
30	1,900	460	361	175	120	279	320
31	2,080	.....	409	145	.....	320	.....

NOTE.—The daily discharges are based on a discharge rating curve which is well defined between 200 and 1,400 second-feet.

Monthly discharge of St. Francis River near St. Francis, Maine, for 1910.

[Drainage area, 560 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
May 11-31	3,300	1,500	2,190	3.91	3.05	C.
June	2,070	460	1,230	2.20	2.46	C.
July	460	240	343	.612	.71	C.
August	516	145	313	.559	.64	C.
September	240	120	161	.288	.32	C.
October	320	120	189	.338	.39	C.
November	830	279	477	.852	.95	C.

MADAWASKA RIVER AT STE. ROSE DU DEGELE, QUEBEC, CANADA.

Madawaska River rises in Lake Temiscouata, in Temiscouata County, Province of Quebec, flows southeastward, and unites with the St. John at Edmundston, New Brunswick.

The gaging station, which is located at the highway bridge crossing the river one-fifth mile from Temiscouata railroad station, 2 miles below the foot of Lake Temiscouata, and 21 miles above the mouth of the river, was established May 12, 1910, by the International Commission, River St. John, by which the discharge records were furnished. The drainage area above this station is 958 square miles.

The gage is a rod nailed to the west abutment of highway bridge, and is referred to levels of the International Commission, River St. John. Gage heights are given as elevations above mean sea level. The banks are high and not liable to overflow. The bottom of the river is composed of sand and gravel.

Some of the discharge measurements were made at the St. Jacques bridge 6 miles above the mouth of the river and referred to the Ste. Rose gage. The Edmundston dam, at the mouth of the river, affects the gage at St. Jacques at certain stages of the river.

The discharge measurements made during 1910 do not define a good discharge rating curve, and the determination of daily discharge is deferred until more data are available.

Discharge measurements of Madawaska River at Ste. Rose du Degele, Quebec, for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 13[a]	Douglas L. McLean [b]			479.04	3,440
24[a]	do			478.14	1,950
July 8[a]	do			477.20	1,145
23[a]	do			476.6	784
Oct. 20[a]	do			476.1	480
22	do	60	222	476.03	400
Nov. 26	do	237	1,539	476.87	1,120

[a] Measurements made at St. Jacques bridge and referred to Ste. Rose gage.
[b] Measurements made under direction of International Commission, River St. John.

Daily gage height, in feet, of Madawaska River at Ste. Rose du Degele, Quebec, for 1910.

[Mrs. Delphis Leveresque, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	479.5	477.4	476.9	476.1	475.9	476.3	476.8
2	.....	479.5	477.3	476.9	476.0	475.9	476.3	476.8
3	.....	476.6	477.3	476.8	476.0	475.9	476.3	476.8
4	.....	479.4	477.2	476.8	476.0	475.9	476.3	476.7
5	.....	479.3	477.2	476.8	476.0	475.9	476.4	476.7
6	.....	479.3	477.1	476.8	476.1	475.9	476.5	476.7
7	.....	479.2	477.2	476.8	476.1	475.9	476.6	476.7
8	.....	479.2	477.2	476.7	476.0	475.9	476.6	476.7
9	.....	479.2	477.1	476.7	476.1	475.9	476.7	476.7
10	.....	479.1	477.1	476.7	476.1	475.8	476.7	476.7
11	.....	479.1	477.1	476.6	476.1	475.8	476.8	476.7
12	483.1	479.0	477.1	476.6	476.1	475.8	476.8	476.7
13	482.8	479.0	477.1	476.5	476.1	475.8	476.9	476.7
14	482.6	478.9	477.1	476.5	476.1	475.9	476.9	476.7
15	482.3	478.8	477.0	476.5	476.1	475.9	476.9	.....
16	482.0	478.7	477.0	476.5	476.0	476.0	476.9	.....
17	481.8	478.6	476.9	476.4	476.0	476.2	476.9	.....
18	481.5	478.5	476.9	476.5	476.0	476.1	476.9	.....
19	481.3	478.4	476.8	476.5	476.0	476.1	476.9	.....
20	481.1	478.4	476.7	476.4	476.0	476.1	476.9	.....
21	480.9	478.3	476.6	476.4	476.0	476.0	476.9	.....
22	480.7	478.2	476.6	476.3	476.0	476.0	476.9	.....
23	480.4	478.2	476.6	476.3	476.0	476.1	476.8	.....
24	480.2	478.1	476.6	476.3	476.0	476.1	476.8	.....
25	480.1	478.0	476.6	476.3	476.0	476.1	476.9	.....
26	480.0	477.9	476.7	476.3	476.0	476.2	476.9	.....
27	480.1	477.8	476.6	476.2	476.0	476.2	476.9	.....
28	479.9	477.7	476.6	476.2	475.9	476.3	476.8	.....
29	479.8	477.6	476.7	476.2	475.9	476.3	476.8	.....
30	479.7	477.5	476.7	476.1	475.9	476.3	476.8	.....
31	479.6	.....	476.9	476.1	.....	476.3	.....	.....

Daily discharge, in second-feet, of Madawaska River at Ste. Rose du Degele, Quebec, for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3,700	1,460	1,020	455	350	575	935
2	.....	3,700	1,360	1,020	400	350	575	935
3	.....	3,820	1,360	935	400	350	575	935
4	.....	3,580	1,280	935	400	350	575	855
5	.....	3,460	1,280	935	400	350	640	855
6	.....	3,460	1,180	935	455	350	710	855
7	.....	3,350	1,280	935	455	350	780	855
8	.....	3,350	1,280	855	400	350	780	855
9	.....	3,350	1,180	855	455	350	855	855
10	.....	3,240	1,180	855	455	305	855	855
11	.....	3,240	1,180	780	455	305	935	855
12	8,220	3,120	1,180	780	455	305	935	855
13	7,830	3,120	1,180	710	455	305	1,020	855
14	7,570	3,010	1,180	710	455	350	1,020	855
15	7,180	2,900	1,100	710	455	350	1,020	.....
16	6,790	2,790	1,100	710	400	400	1,020	.....
17	6,530	2,680	1,020	640	400	515	1,020	.....
18	6,140	2,570	1,020	710	400	455	1,020	.....
19	5,900	2,460	935	710	400	455	1,020	.....
20	5,640	2,460	855	640	400	455	1,020	.....
21	5,400	2,360	780	640	400	400	1,020	.....
22	5,140	2,260	780	575	400	400	1,020	.....
23	4,780	2,260	780	575	400	455	935	.....
24	4,540	2,150	780	575	400	455	935	.....
25	4,420	2,050	780	575	400	455	1,020	.....
26	4,300	1,950	855	575	400	515	1,020	.....
27	4,420	1,850	780	515	400	515	1,020	.....
28	4,180	1,750	780	515	350	575	935	.....
29	4,060	1,650	855	515	350	575	935	.....
30	3,940	1,550	855	455	350	575	935	.....
31	3,820	.....	1,020	455	.....	575	.....	.....

NOTE.—Discharges obtained from a rating curve not well defined.

Monthly discharge of Madawaska River at Ste. Rose du Degele, Quebec, for 1910.

[Drainage area, 958 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
May 12–31	8,220	3,820	5,540	5.78	4.30	C.
June	3,820	1,550	2,770	2.89	3.22	C.
July	1,460	780	1,050	1.10	1.27	C.
August	1,020	455	721	.753	.87	C.
September	455	350	413	.431	.48	C.
October	575	305	414	.432	.50	C.
November	1,020	575	891	.930	1.04	C.
December 1–14	935	855	872	.910	.47	C.

AROOSTOOK RIVER AT FORT FAIRFIELD, MAINE.

The sources of Aroostook River lie adjacent to those of the Mattawamkeag and the East Branch of the Penobscot. Although its drainage area is large—2,230 square miles, nearly all in Maine—its flow is variable because of lack of storage facilities. During the low-water seasons, which frequently occur in both the fall and midwinter, its flow has been known to reach a minimum of 0.06 second-foot per square mile, a remarkably low figure for so large a stream in the northeast.

The gaging station, which was established July 31, 1903, is located at the steel highway bridge in the village of Fort Fairfield, about 3 miles upstream from the international boundary line and about 8 miles below the mouth of Little Madawaska Stream. This station was discontinued December 31, 1910.

The datum of the chain gage, attached to the bridge, has remained unchanged during the maintenance of the station. Discharge measurements are made from the bridge or by wading a short distance below the bridge.

The dam of the Maine & New Brunswick Electric Power Co. is located about a mile east of the international boundary line or about 4 miles below the station. The fall between the two points is so great that the gage heights are not affected by backwater.

Heavy ice exists at this station during the winter.

Conditions for accurate determinations of discharge are good, and an excellent discharge rating curve was developed for 1903–1909. This curve was also used for 1910, although the three measurements made during the open period of 1910 plot uniformly about 200 second-feet less than the curve. The cause for this difference is unknown, and at low stages there may be considerable percentage error in the discharge values owing to the use of the 1909 discharge rating.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of Aroostook River at Fort Fairfield, Maine, for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 18	F. E. Pressey	350	1,020	[a] 6.52	855
May 6	do	482	3,290	10.38	16,900
June 9	W. E. Parsons	391	1,490	6.36	5,150
21	do	358	1,100	5.38	3,230

[a] Gage height to top of ice, 6.70; ice 1.53 feet thick.

Daily gage height, in feet, of Aroostook River at Fort Fairfield, Maine, for 1910.

[F. E. Peterson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.7					7.55		4.5		3.3	3.9	3.4
2					9.1	7.6	5.5	4.4		3.3	3.9	3.4
3					8.75	7.8	5.4	4.35		3.3	3.8	3.35
4					9.5	7.45		4.15		3.3	3.8	3.6
5		7.1	6.0	8.85	10.4	6.8	5.45	4.0		3.3	3.8	3.6
6				9.8	10.4	6.85	5.3	4.0		3.3	4.5	3.7
7				11.65	9.95	6.65	5.6	3.85	3.6	3.3	5.1	3.7
8	7.6			11.9	9.2	6.55	5.5	3.8	3.6	3.3	5.35	3.8
9				11.9	8.8	6.55	5.4	3.7	3.75	3.3	5.3	3.8
10				9.9	8.85	6.4	5.25	3.6	4.15	3.3	5.4	3.8
11				9.8	8.75	6.3	5.25	3.55	4.05	3.3	5.2	3.6
12				9.0	8.3	6.1	5.4	3.45	3.8	3.3	4.5	3.95
13				8.85	7.9	6.05	5.5	3.45	3.8	3.3	4.3	4.2
14				8.75	7.3	6.15	5.5	3.4	3.65	3.3	4.25	4.4
15	7.0			8.5	6.8	6.1	5.5	3.4	3.55	3.3	4.2	4.4
16				8.3	6.45	6.0	5.4	3.4	3.4	3.3	4.15	4.4
17				8.3	6.9	6.15	5.35	3.4	3.4	3.3	4.1	4.4
18				8.6	6.85	6.3	5.3	3.4	3.4	3.3	4.0	4.4
19		7.9	5.5	9.1	6.45	6.2	5.3	3.4	3.4	3.3	4.2	4.4
20				10.4	6.65	6.05	5.15	3.45	3.3	3.15	3.95	4.4
21				11.45	6.8	5.95	5.1	3.5	3.4	3.2	3.85	4.4
22	6.7			12.5	6.6	5.85	5.05	3.5	3.35	3.2	3.6	4.4
23					6.55	5.7	4.9		3.3	3.3	3.55	4.4
24					6.4	5.6	4.75	3.45	3.35	3.3	3.5	4.5
25					6.35	5.5	4.8	3.45	3.3	3.3	3.6	4.5
26		5.7	5.9		6.45	5.4	4.7	3.4	3.25	3.3	3.6	4.5
27					6.85	5.45	4.55	3.4	3.3	3.55	3.5	4.5
28	10.6			12.2	7.9	5.7	4.45	3.5	3.3	4.0	3.5	4.4
29	10.15			11.6	7.7		4.3	3.5	3.3	4.0	3.5	4.4
30	9.35			10.65	7.15	5.5	4.4		3.3	4.1	3.5	4.4
31					7.35		4.3			4.1		4.4

NOTE.—Ice existed at this station from Jan. 1 to Apr. 4, and from about Dec. 4 to 31. Gage heights are to water surface. The thickness of ice during January to March varied from about 1.1 feet to 1.7 feet.

Daily discharge, in second-feet, of Aroostook River at Fort Fairfield, Maine, for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		15,600	8,230	3,620	1,820	[a] 480	310	940	390
2		12,900	8,360	3,620	1,660	[a] 480	310	940	390
3		11,800	8,910	3,420	1,590	[a] 480	310	810	350
4		14,200	7,970	3,420	1,290	[a] 390	310	810	
5	12,100	17,300	6,400	3,520	1,080	[a] 390	310	810	
6	15,200	17,300	6,510	3,230	1,080	[a] 390	310	1,820	
7	21,700	15,700	6,050	3,820	875	580	310	2,850	
8	22,600	13,200	5,830	3,620	810	580	310	3,330	
9	22,600	12,000	5,830	3,420	690	750	310	3,230	
10	15,600	12,100	5,500	3,140	580	1,290	310	3,420	

[a] Estimated from temporary gage of International Commission.

Daily discharge, in second-feet, of Aroostook River at Fort Fairfield, Maine, for 1910—Continued.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	15,200	11,800	5,280	3,140	530	1,140	310	3,040	.....
12	12,600	10,400	4,840	3,420	435	810	310	1,820	.....
13	12,100	9,200	4,740	3,620	435	810	310	1,510	.....
14	11,800	7,590	4,950	3,620	390	635	310	1,440	.....
15	11,000	6,400	4,840	3,620	390	530	310	1,360	.....
16	10,400	5,600	4,640	3,420	390	390	310	1,290	.....
17	10,400	6,630	4,950	3,330	390	390	310	1,220	.....
18	11,300	6,510	5,280	3,230	390	390	310	1,080	.....
19	12,900	5,600	5,060	3,230	390	390	310	1,360	.....
20	17,300	6,050	4,740	2,950	435	310	210	1,010	.....
21	21,000	6,400	4,530	2,850	480	390	240	875	.....
22	24,800	5,940	4,320	2,760	480	350	240	580	.....
23	25,600	5,830	4,020	2,490	480	310	310	530	.....
24	25,200	5,500	3,820	2,240	435	350	310	480	.....
25	24,800	5,380	3,620	2,320	435	310	310	580	.....
26	24,500	5,600	3,420	2,150	390	275	310	580	.....
27	24,100	6,510	3,520	1,900	390	310	530	480	.....
28	23,700	9,200	4,020	1,740	480	310	1,080	480	.....
29	21,600	8,630	3,820	1,510	480	310	1,080	480	.....
30	18,200	7,220	3,620	1,660	480	310	1,220	480	.....
31	.....	7,720	.....	1,510	480	.....	1,220	.....	.....

NOTE.—Daily discharge obtained from the 1909 discharge rating curve. (See description for discussion of the accuracy of this curve.) Discharge interpolated for days when the gage was not read, except for Sept. 1 to 6, which was estimated from the records of the temporary gage of the International Commission, River St. John, located at an old pier about one-fourth mile below the gaging station.

Monthly discharge of Aroostook River at Fort Fairfield, Maine, for 1910.

[Drainage area, 2,230 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	2,100	0.942	1.09	D.
February	.....	.....	1,200	.538	.56	D.
March	.....	.....	1,800	.807	.93	D.
April	25,600	.....	16,500	7.40	8.26	B.
May	17,300	5,380	9,410	4.22	4.86	A.
June	8,910	3,420	5,250	2.35	2.62	B.
July	3,820	1,510	2,950	1.32	1.52	B.
August	1,820	390	666	.299	.34	C.
September	1,290	275	494	.222	.25	D.
October	1,220	210	418	.187	.22	D.
November	3,420	480	1,320	.592	.66	C.
December	.....	.....	350	.157	.18	D.
The year	25,600	210	3,530	1.58	21.49	

NOTE.—Discharge during the winter months based on one measurement made Jan. 18, on climatological records, and on general run-off conditions in northern Maine during the winter of 1910.

Mean discharge Apr. 1 to 4, estimated, 6,750 second-feet.

The accuracy for the months of low discharge is uncertain (see station description, p. 44).

This table supersedes discharge tables published in the first annual report of the Maine State Water Storage Commission.

ST. CROIX RIVER.

GENERAL FEATURES OF AREA DRAINED.

St. Croix River is formed by two principal branches. The East Branch, also known as the Upper St. Croix, is the outlet of the Schoodic Lake system, including Grand and Spednic lakes; the West Branch is formed by the Grand Lake system, including Sysladobsis, Grand, and Big lakes. The St. Croix, including the East Branch, forms nearly half of the eastern boundary of Maine, and its total length is about 100 miles. Tributaries are small and unimportant. The total drainage area is 1,473 square miles at Calais, the East or principal branch draining 644 square miles, and the West Branch 674 square miles at their junction. The river discharges into Passamaquoddy Bay.

The basin is in general lower than that of any other of the larger streams in the State flowing into the Atlantic, its headwaters having an elevation of about 540 feet.

A large part of the drainage basin is still covered with timber, and above Vanceboro and Princeton, at the foot of the two systems of lakes, the region is for the most part wild and inaccessible.

The mean annual precipitation is probably about 41 inches, ranging from 44 inches at Eastport, on the coast, to 38 inches in the northern section. The river is generally frozen over during the winter, although more subject to thaws during this season than rivers draining basins farther inland.

The lake system of the St. Croix is the largest in the State in proportion to the drainage basin, except that of the Presumpscot, which is, however, a much smaller stream. The lake surface of the Upper St. Croix aggregates 48.62 square miles, and that of the West Branch 82.64 square miles, as determined from recent studies of the Maine State Water Storage Commission. In fact, above Vanceboro and Princeton each branch of the river is simply a succession of lakes almost to the extreme headwaters. The total lake surface of the St. Croix is 134.46 square miles, or about one-eleventh the total drainage area.

The St. Croix is a valuable stream for water power, owing to its very uniform flow. Power has been developed at Calais, Baring, and Woodland, principally for the manufacture of pulp, paper, and lumber. Opportunities for increased storage are excellent, and a systematic regulation of water areas easily controlled by dams would make this one of the best power streams in the country.

The river is navigable as far as Calais, except for the two or three months in the year when it is frozen.

ST. CROIX RIVER NEAR WOODLAND, MAINE.

This station was originally established December 4, 1902, at a point a short distance above Sprague Falls, now called Woodland, near Baring, Maine. On June 8, 1905, it was moved about 1½ miles downstream to avoid backwater effect from a paper mill and dam constructed at Sprague Falls. It is about 10 miles below the junction of the West with the East Branch, and about 14 miles above the mouth of the St. Croix. Power plants are numerous along the river, the nearest being at Woodland, above, and at Baring, 5 miles below. Backwater from the lower dam extends about 2 miles and does not affect the flow at the station.

There is no determined relation between the gage datums at the original and present locations of the station. A vertical staff gage is attached to a bowlder on the left bank about 1 mile below the dam at Sprague Falls. A chain gage for use in high water is located on the left bank about 300 feet above the staff gage. The cable from which discharge measurements are made is at a point about 400 feet below the staff gage. During the winter the discharge is usually not affected by ice, because the operation of the mill above tends to keep the channel open. In the log-driving season the discharge is often materially affected by log jams. On Sundays and holidays and occasionally at other times when the natural discharge is relatively low, the mill is shut down and water stored, which usually greatly reduces the discharge on such days.

When the channel at this station is unobstructed, the conditions favor accuracy of discharge measurements, and for such periods a good discharge rating curve has been developed. During 1910, however, conditions were especially poor. The first four measurements indicated an apparent backwater effect of 0.15 foot; the other three measurements define a discharge rating curve with an apparent backwater effect of about 0.75 foot. Hence, the discharge from January 1 to June 28 is determined from the discharge rating curve defined by the first four measurements of the year, and the discharge for June 29 to August 11 from a rating curve defined by the remaining 3 measurements. From August 12 to 23 shifting-channel methods were adopted to cover the period of transition between backwater conditions and conditions of free flow. It is very uncertain when this change from backwater to free flow took place and, consequently, values from August 24 to the end of the year, which are based on the unobstructed channel discharge rating curve, are somewhat uncertain.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of St. Croix River near Woodland, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 14[a]	F. E. Pressey	296	1,160	7.97	2,290
Mar. 11	do	284	1,240	8.68	3,520
May 12[b]	do	276	1,180	8.32	2,860
June 16[b]	W. E. Parsons	280	1,110	7.98	2,520
July 19[b]	do	280	1,210	8.28	1,960
21[b]	do	285	1,270	8.43	2,270
Aug. 9[b]	do	285	1,160	8.20	1,820

[a] Affected by anchor ice.
[b] Affected by backwater from log jam.

Daily gage height, in feet, of St. Croix River near Woodland, Maine, for 1910.

[Simeon Phinney, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			8.2	7.9		7.8	8.4	8.3	7.7		7.1	7.2
2		8.3	8.2	8.1	8.4	7.9		8.2	7.7		7.1	7.45
3	7.8		8.1		8.5	7.9		8.1	7.7	7.6	7.0	7.4
4			8.0	7.9	8.5	7.9		8.0		7.6	6.8	
5			8.0	7.9	8.4		8.5	8.4		7.7	6.6	
6				7.8	8.3	8.0	8.4	8.4		7.7		7.3
7		8.2		7.8	8.3	8.1	8.4		7.6	7.7	6.6	7.3
8		8.0		8.1		8.3	8.4	8.3	7.7	7.7	6.7	7.2
9		8.0	8.9	8.1	8.3	8.4	8.4	8.2	7.7		6.8	
10		8.0	8.8		8.3	8.5		8.2	7.6	7.7	6.8	7.1
11			8.7	8.0	8.2	8.6	8.5	8.1		7.8	6.8	
12			8.5	8.0	8.2		8.5	8.0	7.6			7.0
13				7.9			8.5	7.9	7.6			6.9
14	8.0		8.1	7.9		8.6			7.7		7.0	6.7
15			8.1	8.0		8.4	8.6	7.9	7.7		7.0	6.6
16			8.0	8.0	8.0	8.3	8.6	7.9	7.8		7.1	6.6
17		8.0	8.0		8.0	8.0		7.8	7.8	7.7	7.1	
18			8.0	8.0	7.9		8.5	7.8		7.7	7.1	
19				8.1	7.8		8.5	7.7	7.7	7.6	7.1	
20				8.3	7.7	8.0	8.6	7.7	7.7	7.6		6.8
21	8.0		8.0	8.5	7.7	8.1	8.6		7.6	7.6	7.0	7.0
22			8.0	8.5		8.1		7.7	7.6	7.6	7.0	7.0
23			8.0	8.5	7.5	8.0	8.6	7.7			7.0	7.1
24		8.0	8.1		7.5	8.1		7.6		7.5	7.0	
25			8.0	8.5	7.5	8.1	8.5	7.6		7.4	7.0	
26			8.1	8.5	7.6		8.5	7.6	7.6	7.4	7.0	
27				8.5	7.6	8.1	8.5	7.6	7.6	7.3		7.1
28			8.0	8.6	7.7	8.2	8.4		7.7		7.0	7.1
29	9.0		8.1	8.5		8.4	8.4	7.6	7.7	7.2	7.1	7.1
30			8.0	8.4	7.7	8.4		7.7	7.7		7.1	
31			7.9		7.7			7.7		7.1		

NOTE.—The discharge was probably not much affected by ice during 1910. Note, however, that the measurement made Jan. 14 showed backwater effect, which was duly allowed for in the discharge rating curve used. The gage heights during the greater portion of the year were much affected by backwater from log jams.

Daily discharge, in second-feet, of St. Croix River near Woodland, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,200	3,170	2,720	2,280	3,030	2,140	2,160	2,030	2,230	2,230	1,470	1,590
2	500	2,870	2,720	2,570	3,030	2,280	2,200	1,900	2,230	1,000	1,470	1,900
3	2,140	2,840	2,570	2,420	3,190	2,280	2,230	1,780	2,230	2,090	1,360	1,830
4	2,140	2,810	2,420	2,280	3,190	2,280	2,260	1,660	1,000	2,090	1,150	1,000
5	2,170	2,780	2,420	2,280	3,030	2,350	2,300	2,160	1,000	2,230	950	1,710
6	2,200	500	2,420	2,140	2,870	2,420	2,160	2,160	2,230	2,230	1,000	1,710
7	2,220	2,720	2,910	2,140	2,870	2,570	2,160	2,100	2,090	2,230	950	1,710
8	2,250	2,420	3,400	2,570	2,870	2,870	2,160	2,030	2,230	2,230	1,050	1,590
9	500	2,420	3,890	2,570	2,870	3,030	2,160	1,900	2,230	1,000	1,150	1,470
10	2,310	2,420	3,710	2,500	2,870	3,190	2,230	1,900	2,090	2,230	1,150	1,470
11	2,340	2,420	3,530	2,420	2,720	3,360	2,300	1,780	1,000	2,370	1,150	1,000
12	2,360	2,420	3,190	2,420	2,720	3,360	2,300	1,750	2,090	2,230	1,150	1,360
13	2,390	500	2,880	2,280	2,640	3,360	2,300	1,680	2,090	2,230	1,000	1,250
14	2,420	2,420	2,570	2,280	2,570	3,360	2,370	1,740	2,230	2,230	1,360	1,050
15	2,420	2,420	2,570	2,420	2,500	3,030	2,440	1,810	2,230	2,230	1,360	950
16	500	2,420	2,420	2,420	2,420	2,870	2,440	1,870	2,370	1,000	1,470	950
17	2,420	2,420	2,420	2,420	2,420	2,420	2,370	1,820	2,370	2,230	1,470	950
18	2,420	2,420	2,420	2,420	2,280	2,420	2,300	1,870	1,000	2,230	1,470	1,000
19	2,420	2,420	2,420	2,570	2,140	2,420	2,300	1,830	2,230	2,090	1,470	1,150
20	2,420	500	2,420	2,870	2,010	2,420	2,440	1,910	2,230	2,090	1,000	1,150
21	2,420	2,420	2,420	3,190	2,010	2,570	2,440	1,990	2,090	2,090	1,360	1,360
22	2,630	2,420	2,420	3,190	1,880	2,570	2,440	2,070	2,090	2,090	1,360	1,360
23	500	2,420	2,420	3,190	1,760	2,420	2,440	2,150	2,090	1,000	1,360	1,470
24	3,040	2,420	2,570	3,190	1,760	2,570	2,370	2,090	2,090	1,960	1,360	1,470
25	3,240	2,480	2,420	3,190	1,760	2,570	2,300	2,090	1,000	1,830	1,360	1,000
26	3,450	2,540	2,570	3,190	1,880	2,570	2,300	2,090	2,090	1,830	1,360	1,000
27	3,660	500	2,500	3,190	1,880	2,570	2,300	2,090	2,090	1,710	1,000	1,470
28	3,860	2,660	2,420	3,360	2,010	2,720	2,160	2,090	2,230	1,710	1,360	1,470
29	4,070	.....	2,570	3,190	2,010	2,160	2,160	2,090	2,230	1,590	1,470	1,470
30	500	.....	2,420	3,030	2,010	2,160	2,120	2,230	2,230	1,000	1,470	1,470
31	3,470	.....	2,280	.....	2,010	.....	2,070	2,230	.....	1,470	.....	1,470

NOTE.—See description for discussion of discharge rating curves used for 1910. Discharge estimated or interpolated for Sundays and other days on which the gage was not read.

Monthly discharge of St. Croix River near Woodland, Maine, for 1910.

[Drainage area, 1,420 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	4,070	500	2,310	1.63	1.88	B.
February	3,170	500	2,260	1.59	1.66	B.
March	3,890	2,280	2,680	1.89	2.18	B.
April	3,360	2,140	2,670	1.88	2.10	B.
May	3,190	1,760	2,430	1.71	1.97	B.
June	3,360	2,140	2,640	1.86	2.08	B.
July	2,440	2,070	2,280	1.61	1.86	C.
August	2,230	1,660	1,960	1.38	1.59	C.
September	2,370	1,000	1,990	1.40	1.56	C.
October	2,370	1,000	1,900	1.34	1.54	C.
November	1,470	950	1,270	.894	1.00	B.
December	1,900	950	1,350	.951	1.10	B.
The year	4,070	500	2,140	1.51	20.52	

NOTE.—This table supersedes tables published in the first annual report of the Maine State Water Storage Commission.

GRAND LAKE, MAINE.

Grand Lake is in Tps. 5 and 6, N. D.; 5 and 6, Range 1, N. B. P. P.; and 3, Range 1, T. S., and is on the West Branch of St. Croix River. The area of the lake is 23.5 square miles. A dam at the outlet gives an available storage depth of about 8 feet. The nearest gaging station on the West Branch of St. Croix River is at Baileyville, about 4 miles from Princeton village.

The following table gives the dates of opening or the disappearance of ice from this lake since 1878, the record being furnished by M. P. Kneeland, game warden, Princeton, Maine, to the Commissioners of Inland Fisheries and Game:

Dates of opening of Grand Lake, Maine.

1878, Apr. 26.	1890, May 8.	1902, Apr. 8.
1879, May 10.	1891, May 4.	1903, Apr. 20.
1880, May 2.	1892, Apr. 30.	1904, May 5.
1881, May 3.	1893, May 9.	1905, Apr. 28.
1882, May 6.	1894, Apr. 30.	1906, May 5.
1883, May 9.	1895, May 2.	1907, May 5.
1884, Apr. 30.	1896, Apr. 29.	1908, May 6.
1885, May 5.	1897, May 4.	1909, Apr. 30.
1886, May 3.	1898, Apr, 27.	1910, Apr. 11.
1887, May 11.	1899, Apr. 27.	1911, May 3.
1888, May 17.	1900, Apr. 29.	
1889, Apr. 26.	1901, Apr. 25.	

WEST BRANCH OF ST. CROIX RIVER AT BAILEYVILLE, MAINE.

This station, which is located at the highway bridge 1 mile from Baileyville—a station on the Washington County Railroad—and about 4 miles below Princeton, was established May 10, 1910. The drainage area is 509 square miles.

A standard chain gage is attached to the bridge. Discharge measurements are made from the downstream side of the bridge.

The channel is about 225 feet wide and the current is broken by four piers. The banks are of medium height, but extreme high water is liable to flow around the abutments of the bridge.

The discharge rating curve for this station has not been developed owing to insufficient measurements. Some of these measurements cover periods of backwater from log jams below the station and will be used later in interpolating the discharge for such backwater periods.

Discharge measurements of West Branch of St. Croix River at Baileyville, Maine, for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 9[a]	F. E. Pressey	153	432	4.99	586
10	do	153	484	5.32	1,130
June 15[a]	W. E. Parsons	153	410	4.88	662
24	do	154	484	5.33	1,130
July 19	do	153	375	4.75	742
20	do	153	374	4.70	683
Aug. 9	do	153	423	5.00	670

[a] Affected by backwater.

Daily gage height, in feet, of West Branch of St. Croix River at Baileyville, Maine, for 1910.

[Herbert H. Gardner, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.1	5.5	4.45	4.35	4.3	4.5	4.5
2	.....	5.15	5.3	4.45	4.3	4.3	4.6	4.6
3	.....	5.15	5.0	4.45	4.3	4.35	4.2	4.6
4	.....	5.1	4.45	4.4	4.2	4.4	4.05	4.6
5	.....	5.05	4.7	4.5	4.3	4.8	4.05	4.6
6	.....	5.05	4.5	5.15	4.4	4.8	4.2	4.5
7	.....	4.95	4.5	5.1	4.7	4.7	4.55	4.6
8	.....	5.1	4.65	5.1	4.35	4.3	4.55	4.8
9	.....	5.45	4.55	5.0	4.4	4.3	4.5	4.7
10	5.5	5.55	4.45	4.9	4.3	4.3	4.35	4.4
11	6.2	5.05	4.5	4.85	4.2	4.1	4.2	4.2
12	5.85	4.7	4.55	4.7	4.25	4.2	4.3	4.2
13	5.5	4.8	4.7	4.75	4.6	4.6	4.25	4.3
14	5.35	4.95	4.55	4.6	4.75	4.55	4.5	4.3
15	5.0	5.3	4.4	4.65	4.6	4.05	4.95	4.5
16	6.05	5.45	4.45	4.8	4.45	4.0	4.8	4.5
17	5.45	5.5	4.45	5.0	4.5	4.3	4.8	4.4
18	5.1	5.3	4.55	4.7	4.5	4.55	4.8	4.6
19	5.25	5.45	4.8	4.5	4.45	4.6	4.8	4.6
20	5.3	6.0	4.8	4.5	4.6	4.65	4.7	4.8
21	5.25	5.7	4.85	4.45	4.9	4.65	4.7	5.0
22	5.3	5.45	4.45	4.75	4.8	4.6	4.7	5.0
23	5.25	5.2	4.4	5.05	4.75	4.35	4.7	4.8
24	5.3	5.2	4.35	5.0	4.75	4.8	4.7	4.6
25	5.35	5.25	4.35	4.85	4.6	4.55	4.6	4.1
26	5.35	4.95	4.3	4.45	4.5	4.55	4.6	4.0
27	5.25	5.15	4.35	4.35	4.25	4.55	4.4	4.2
28	4.9	5.25	4.45	4.15	4.2	4.55	4.05	4.2
29	5.0	5.2	4.45	4.35	4.25	4.35	4.1	4.4
30	5.05	5.25	4.5	4.25	4.3	4.05	4.25	4.5
31	5.2	.....	4.45	4.3	.....	4.5	.....	4.7

NOTE.—Relation between gage height and discharge was probably not affected by ice during December.

MACHIAS RIVER.

GENERAL FEATURES OF AREA DRAINED.

Machias River is fairly representative of several of the smaller streams in Maine that discharge their waters into the ocean and are commonly referred to as "coastal rivers." It rises in the Machias Lakes, in the near vicinity of the Grand Lake system of the St. Croix, flows in a generally southeasterly direction to tidewater at Machias, a distance of some 50 miles, and its drainage area measures 495 square miles. At East Machias, near the mouth, it is joined by

East Machias River, a stream of similar characteristics rising in Pocamoonshine Lake, near Princeton, and draining about 345 square miles.

The Machias drainage basin is considerably broken with hills or low mountains, and attains an altitude in its northwestern portion of about 400 feet above sea level. Near the coast the prevailing rock is quartzite; farther inland granite is found; and near the headwaters mica schists prevail. The basin is generally forested.

The mean annual rainfall is probably about 42 inches, or a little greater than that of the St. Croix basin, and winter conditions are similar to those of the St. Croix.

In the whole Machias basin there are 53.88 square miles of lake surface which are, however, largely near the headwaters. They are utilized to a small extent for log driving.

There are good water-power sites on the Machias and its principal branch, and developments have been made at Machias, East Machias, and Whitneyville.

MACHIAS RIVER AT WHITNEYVILLE, MAINE.

This station was established October 17, 1903, and was originally located at the bridge of the Washington County Railroad, near Whitneyville, about 8 miles above the mouth of the river.

A chain gage is attached to the railroad bridge. On October 3, 1905, a vertical-staff gage was placed on a pier of the wooden highway bridge, about one-half mile upstream from the railroad bridge. Published gage heights, 1906–1909, refer to the staff gage. The present gage is a chain gage attached to the highway bridge August 10, 1910, and referred to the same datum as the staff gage. The relationship between the old gage on the railroad bridge and the present gage on the highway bridge has not been determined.

About 200 feet above the station is a storage dam which causes considerable fluctuations in the gage heights at low-water periods, owing to daily opening and closing of the gates. At the original location backwater from the dam at Machias, about 4 miles below, or from accumulations of logs, occurred during a considerable portion of the time, and some of the gage heights previous to October 3, 1905, are liable to very considerable errors. Discharge measurements are made from the railroad bridge.

During the winter months the discharge is often affected by ice, although operation of the dam above tends to prevent the formation of ice except during severe winters. Conditions for obtaining accurate measurements at the new location are fair, and a fair discharge rating curve has been developed, except at low stages, which are somewhat uncertain.

The discharge prior to 1909 has been computed for all years since the establishment of the station, and republished in Water-Supply Paper 241. The 1903–4 values as published in Water-Supply Paper 124 were revised on the basis of new and more accurate rating curves. The discharge is materially affected at times during the driving season by log jams.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of Machias River at Whitneyville, Maine, for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 13	F. E. Pressey	125	562	4.30	[a] 463
Mar. 10[b]	do	125	1,130	7.88	2,970
May 13	do	125	723	4.92	1,010
June 14[c]	W. E. Parsons	126	819	5.84	948
Aug. 10	do	126	628	3.71	420

[a] Low discharge due to anchor ice; ice at gaging section 1.10 feet thick.
[b] Temporary backwater caused by ice jam.
[c] Temporary backwater caused by log jam on right shore below bridge, the wing extending from a point 200 feet below bridge to the gage.

Daily gage height, in feet, of Machias River at Whitneyville, Maine, for 1910.

[Ira S. Albee, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.6	7.0	6.6	5.0	7.9	5.3	5.0	3.9	3.3	4.2	3.1	3.6
2	4.6	6.6	6.3	5.0	7.8	5.2	5.0	3.8	3.2	3.8	3.1	3.8
3	4.55	6.0	5.9	5.0	7.7	5.1	5.3	3.7	3.2	3.6	3.1	3.7
4	4.55	5.2	5.6	5.0	7.5	5.0	5.6	3.8	3.2	3.5	3.1	3.7
5	4.6	5.0	5.4	5.0	7.1	4.9	6.0	3.9	3.2	3.4	3.1	3.6
6	4.65	5.0	5.2	5.0	6.6	4.8	5.5	4.0	3.2	3.4	3.1	3.5
7	4.65	5.1	5.2	5.1	6.1	4.8	5.0	4.0	3.2	3.3	3.1	3.4
8	4.7	5.2	9.5	5.1	5.6	4.8	4.8	4.0	3.1	3.2	3.1	3.3
9	4.7	5.0	9.1	5.1	5.3	4.8	5.0	3.9	3.05	3.2	3.1	3.2
10	4.6	4.8	7.8	5.1	5.3	4.9	5.0	3.7	3.0	3.2	3.2	3.1
11	4.6	4.6	7.0	5.0	5.2	5.0	4.7	3.7	3.0	3.15	3.2	3.0
12	4.5	4.4	5.6	4.9	5.0	5.2	4.3	3.6	3.1	3.1	3.2	3.0
13	4.3	4.3	5.4	4.8	5.0	5.5	4.2	3.5	3.2	3.1	3.2	3.0
14	4.3	4.3	5.3	4.8	5.6	5.8	4.1	3.4	3.2	3.1	3.2	3.0
15	4.3	4.4	5.2	4.9	6.1	5.4	4.0	3.4	3.2	3.0	3.2	3.0
16	4.4	4.4	5.1	5.0	6.5	5.0	4.0	3.3	3.2	3.0	3.2	3.0
17	4.4	4.5	5.0	5.0	7.0	4.9	3.9	3.3	3.2	3.0	3.15	3.0
18	4.4	4.6	4.9	5.1	7.3	4.8	3.8	3.3	3.2	3.0	3.1	3.0
19	4.5	4.7	4.8	5.4	7.4	4.8	3.8	3.4	3.3	3.1	3.1	2.95
20	5.0	4.8	4.8	6.2	7.3	4.85	3.75	3.4	3.4	3.1	3.1	2.9
21	5.1	4.9	4.8	7.8	7.2	4.9	3.7	3.4	3.5	3.1	3.1	3.0
22	5.1	5.0	4.9	7.0	7.0	4.95	3.7	3.4	3.6	3.1	3.1	3.0
23	7.5	5.0	5.0	7.0	6.8	5.0	3.7	3.35	3.7	3.1	3.1	3.0
24	7.8	5.0	5.0	7.0	6.6	5.2	3.8	3.3	3.7	3.1	3.1	3.0
25	6.0	5.0	5.0	7.0	6.4	5.3	3.9	3.3	3.7	3.1	3.1	4.1
26	5.9	5.0	5.1	7.0	6.2	5.2	4.0	3.3	3.8	3.1	3.1	5.0
27	5.4	5.0	5.2	7.5	6.0	5.2	4.1	3.3	3.8	3.1	3.1	4.7
28	5.4	5.8	5.1	8.0	5.8	5.1	4.0	3.3	4.0	3.1	3.2	4.5
29	5.3	.....	5.0	8.1	5.6	5.0	4.0	3.3	4.3	3.1	3.3	4.3
30	6.9	.....	5.0	8.1	5.4	5.0	4.0	3.3	4.3	3.1	3.4	4.1
31	7.4	.....	5.0	.....	5.45	.....	4.0	3.3	.....	3.1	.....	4.2

NOTE.—The river was probably not completely frozen over at the gage section during the winter, although more or less backwater was doubtless caused by ice below the gage. Backwater caused by ice jam existed from about Mar. 8 to 11, and from a log jam from about June 11 to 16. It is also probable that backwater from log jams occurred temporarily at other times during 1910.

Daily discharge, in second-feet, of Machias River at Whitneyville, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	814	2,650	2,290	1,070	3,480	1,280	1,070	433	191	587	132	300
2	814	2,290	2,040	1,070	3,380	1,210	1,070	387	161	387	132	387
3	784	1,800	1,720	1,070	3,280	1,140	1,280	343	161	300	132	343
4	784	1,210	1,490	1,070	3,100	1,070	1,490	387	161	260	132	343
5	814	1,070	1,350	1,070	2,740	1,000	1,800	433	161	224	132	300
6	844	1,070	1,210	1,070	2,290	937	1,420	482	161	224	132	260
7	844	1,140	1,210	1,140	1,880	937	1,070	482	161	191	132	224
8	875	1,210	.....	1,140	1,490	937	937	482	132	161	132	191
9	875	1,070	.....	1,140	1,280	937	1,070	433	118	161	132	161
10	814	937	.....	1,140	1,280	1,000	1,070	343	105	161	161	132
11	814	814	.....	1,070	1,210	.....	875	343	105	146	161	105
12	755	698	1,490	1,000	1,070	.....	642	300	132	132	161	105
13	642	642	1,350	937	1,070	.....	587	260	161	132	161	105
14	642	642	1,280	937	1,490	.....	534	224	161	132	161	105
15	642	698	1,210	1,000	1,880	.....	482	224	161	105	161	105
16	698	698	1,140	1,070	2,200	.....	482	191	161	105	161	105
17	698	755	1,070	1,070	2,650	1,000	433	191	161	105	146	105
18	698	814	1,000	1,140	2,920	937	387	191	161	105	132	105
19	755	875	937	1,350	3,010	937	387	224	191	132	132	93
20	1,070	937	937	1,960	2,920	968	365	224	224	132	132	81
21	1,140	1,000	937	3,380	2,830	1,000	343	224	260	132	132	105
22	1,140	1,070	1,000	2,650	2,650	1,040	343	224	300	132	132	105
23	3,100	1,070	1,070	2,650	2,470	1,070	343	208	343	132	132	105
24	3,380	1,070	1,070	2,650	2,290	1,210	387	191	343	132	132	105
25	1,800	1,070	1,070	2,650	2,120	1,280	433	191	343	132	132	534
26	1,720	1,070	1,140	2,650	1,960	1,210	482	191	387	132	132	1,070
27	1,350	1,070	1,210	3,100	1,800	1,210	534	191	387	132	132	875
28	1,350	1,640	1,140	3,580	1,640	1,140	482	191	482	132	161	755
29	1,280	.....	1,070	3,680	1,490	1,070	482	191	642	132	191	642
30	2,560	.....	1,070	3,680	1,350	1,070	482	191	642	132	224	534
31	3,010	.....	1,070	.....	1,380	.....	482	191	.....	132	.....	587

NOTE.—Daily discharge determined from a rating curve which is well defined between discharges about 200 and 4,000 second-feet.

Monthly discharge of Machias River at Whitneyville, Maine, for 1910.

[Drainage area, 465 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	3,380	642	1,210	2.60	3.00	C.
February	2,650	642	1,110	2.39	2.49	C.
March	.....	937	1,520	3.27	3.77	C.
April	3,680	937	1,770	3.81	4.25	B.
May	3,480	1,070	2,150	4.62	5.33	B.
June	1,280	937	1,050	2.26	2.52	B.
July	1,800	343	718	1.54	1.78	B.
August	482	191	283	.609	.70	D.
September	642	105	242	.520	.58	D.
October	587	105	172	.370	.43	D.
November	224	132	145	.312	.35	D.
December	1,070	81	293	.630	.73	D.
The year	.....	81	888	1.91	25.93	

NOTE.—Mean discharge Mar. 8 to 11, estimated, 3,380 second-feet; mean discharge June 11 to 16, estimated 1,000 second-feet.

This table supersedes tables published in the first annual report of the Maine State Water Storage Commission.

UNION RIVER BASIN.

GENERAL FEATURES OF AREA DRAINED.

Union River is formed by the junction of its East and West branches.

The West Branch rises in the extreme northern part of Hancock County, in Tps. 39 and 40 MD, and flows in a general southerly direction for about 35 miles to its junction with the East Branch. In its course it passes through Brandy and Great ponds and receives the tributaries from a number of other ponds, the largest of which is Alligator Pond. The area contains little cultivated land, except near the town of Amherst. From Great Pond to Mariaville (17 miles) the fall of the river averages 10.6 feet per mile. This fall per mile is exceeded at several places, where the opportunities for power development are excellent.

The East Branch rises in the Lead Mountain Ponds, in T. 28 MD, flows southerly for 8 or 9 miles to Rocky Pond, then southwesterly to Spectacle Pond, then northerly and westerly some 10 miles to its junction with the West Branch about a mile above Jordan's bridge, in Waltham. The territory drained is practically all woodland, either recently cut or covered with second growth. The river is made up of flat stretches alternating with quick falls. Opportunities for power development are numerous. The East Branch receives only two important tributaries—Middle Branch, which rises in the town of Aurora, and Bog River, which rises in the town of Eastbrook.

From the junction of the two branches the river flows southward about 15 miles, meeting tidewater at Ellsworth. The valley in this distance is flat, wide, and fertile. At Ellsworth Falls there are two dams, with a total head of about 25 feet. At Ellsworth the new dam of the Bar Harbor & Union River Power Co. develops about a 60-foot head. The tributary streams entering from the west are the outlet of Floods Pond, Beach Hill Stream, Green Lake Stream, and Branch Lake Stream; from the east Webbs Brook is the only important tributary.

The average annual precipitation in this basin is probably about 48 inches. As a rule the winters are not severe, owing to the proximity of the ocean.

The following table shows the areas drained by a number of the tributaries and by the two larger lakes of the basin:

Drainage areas, in square miles, in Union River basin.

River or lake.	Location.	Drainage area.
Union River	Jordan's bridge, 0.75 mile below forks	312
Do	Ellsworth gaging station	537
West Branch	Amherst gaging station	140
Do	Mariaville, Goodwin's bridge	172
East Branch	Waltham	123
Webbs Brook	Old gaging station	50
Branch Lake	Outlet	31
Green Lake	do	47

RIVER AND LAKE SURVEYS IN UNION RIVER BASIN.

Special river and lake surveys have been made in the Union River basin by the United States Geological Survey in cooperation with the State of Maine.

The resulting maps from these surveys include:

Union River, Ellsworth to Great Pond	2 sheets.
Abraham Pond, Scammons Pond, Molasses Pond, Webbs Pond Outlet	1 sheet.
Alligator Pond, Rocky Pond, Spectacle Pond	1 sheet.
Great Pond, Green Lake Outlet, Branch Lake Outlet	1 sheet.

The river maps show not only the plan of the river with 5-foot contour along the banks, but also the profiles of the rivers. These maps are of value in studying developed and undeveloped water power sites, and in connection with the stream-gaging records they afford data for a close estimate of the total horsepower that can be developed at the unutilized falls and rips. The lake maps are valuable in computing the capacity of the lakes in cubic feet, if their use as storage reservoirs is contemplated.

The maps may be obtained free of charge by applying to C. C. Babb, district engineer, United States Geological Survey, State House, Augusta, Me.

The following table gives the areas of water surface of a number of lakes and ponds in the Union River basin, as measured from recent topographic sheets, and the maps of the special lake surveys:

Lake and pond areas, Union River drainage basin.

	Square miles.		Square miles.
Branch Lake	4.33	Abraham Pond	0.69
Green Lake	4.43	Scammons Pond	1.11
Mountain Pond	1.09	Molasses Pond	1.90
Floods Pond	1.01	Alligator Pond	1.73
Beech Hill Pond	2.09	Rocky Pond	.96
Great Pond	1.01	Spectacle Pond	2.74
Webbs Pond	1.43		

WEST BRANCH OF UNION RIVER AT AMHERST, MAINE.

This station, which is maintained in cooperation with the State of Maine, was established July 25, 1909, at Sumner's bridge, three-fourths of a mile west of Amherst post office, on the road to Bangor, and about 1 mile below the highway bridge at the old tannery dam. The drainage area is 140 square miles.

Discharge measurements are made from the downstream side of the bridge to which the chain gage is attached. The original gage was a staff gage. A chain gage was installed June 2, 1910.

Conditions favor the accurate determination of flow. All the dams above the station are partly or totally destroyed, hence the flow is not affected by storage. Anchor ice affects the winter flow. The gage datum was unchanged during the year. The discharge rating curve though incomplete is fairly well outlined for low stages. Estimates of discharge are withheld for the present, however, pending the completion of the rating curve to high stages.

Discharge measurements of West Branch of Union River at Amherst, Maine., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 12[a]	F. E. Pressey	43	154	8.05	106
Mar. 8[b]	do	42.5	349	11.70	1,010
9[b]	do	42.5	309	10.80	847
June 2	do	45	128	6.50	203
July 27	W. E. Parsons	37	81	5.40	39
27	do	37	78	5.40	37
Aug 30	do	28	71	5.30	37

[a] Ice present 1.37 feet thick. [b] Affected by backwater.

Daily gage height, in feet, of West Branch of Union River at Amherst, Maine, for 1910.

[Floyd Sumner, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.40	.....	.....	8.35	9.00	6.50	6.43	5.40	5.30	5.36	5.70	5.80
2	8.50	9.00	10.80	8.45	9.05	6.50	6.38	5.40	5.28	5.37	5.63	5.80
3	8.30	.....	.....	8.42	8.40	6.41	6.23	5.41	5.20	5.35	5.60	5.88
4	8.20	.....	.....	8.35	8.40	6.36	6.51	5.45	5.12	5.30	5.60	6.20
5	8.10	8.80	10.30	8.30	8.30	6.28	6.26	6.78	5.12	5.35	5.62	6.30
6	8.10	.....	.....	8.20	8.20	6.20	6.16	6.48	5.10	5.32	5.63	6.50
7	8.20	.....	.....	8.25	8.08	6.15	6.07	6.53	5.30	5.32	5.66	6.65
8	8.10	.....	11.70	8.30	7.90	6.12	6.15	6.60	5.25	5.35	5.64	6.45
9	8.30	11.40	10.64	8.30	7.75	6.12	6.10	6.58	5.23	5.32	5.70	6.25
10	8.10	.....	9.30	8.22	7.60	6.12	5.97	6.53	5.23	5.33	5.68	6.10
11	8.00	.....	8.50	8.20	7.45	6.11	5.88	6.52	5.23	5.30	5.68	5.71
12	8.05	10.80	8.50	8.10	7.30	6.05	5.82	6.21	5.20	5.27	5.68	5.90
13	.....	.....	8.40	7.85	7.20	6.36	5.74	6.10	5.20	5.25	5.62	5.80
14	.....	.....	8.30	7.68	7.05	6.29	5.64	6.00	5.57	5.21	5.60	5.80
15	7.80	.....	8.10	7.50	6.95	6.22	5.60	5.90	5.50	5.19	5.57	5.78
16	.....	9.80	7.95	7.38	6.85	6.18	5.59	5.81	5.50	5.18	5.55	5.78
17	.....	.....	7.85	7.20	6.70	6.12	5.58	5.73	5.57	5.18	5.57	5.75
18	.....	.....	7.75	7.10	6.58	6.43	5.52	5.70	5.60	5.17	5.54	5.75
19	8.02	9.80	7.50	7.55	6.60	6.50	5.44	5.73	5.58	5.15	5.48	5.87
20	.....	.....	7.32	8.42	6.52	6.55	5.42	5.79	5.53	5.13	5.51	5.87
21	.....	.....	7.38	8.62	6.42	6.53	5.44	5.53	5.50	5.12	5.51	5.80
22	8.02	10.25	7.39	8.82	6.35	6.58	5.42	5.52	5.45	5.08	5.87	5.70
23	.....	.....	7.32	8.90	6.30	6.51	5.42	5.50	5.40	5.10	5.38	5.70
24	.....	.....	7.28	8.80	6.25	6.45	5.42	5.51	5.49	5.10	5.58	5.73
25	.....	10.30	7.35	8.80	6.22	6.41	5.42	5.58	5.36	5.10	5.58	7.46
26	8.90	.....	7.90	8.75	6.22	6.34	5.42	5.48	5.36	5.12	5.58	.....
27	.....	.....	7.90	9.70	6.40	6.28	5.50	5.43	5.33	5.35	5.50	.....
28	.....	.....	7.90	9.40	6.42	6.35	5.40	5.43	5.38	5.45	5.52	7.15
29	10.00	.....	7.90	9.10	6.40	6.38	5.40	5.38	5.36	5.52	5.62	.....
30	.....	.....	8.05	8.80	6.40	6.40	5.40	5.38	5.35	5.62	5.65	.....
31	.....	.....	8.10	.....	6.48	.....	5.36	5.30	.....	5.54	.....	7.38

NOTE.—Gage heights affected by ice from Jan. 1 to Mar. 8, Dec. 14 to 31, and probably Dec. 1 to 13. Gage heights were probably taken to water surface. The ice thickness during January, February, and March, varied from about 1.2 feet to 1.8 feet; during December it attained a thickness of about 0.8 foot.

UNION RIVER AT ELLSWORTH, MAINE.

A concrete dam about 60 feet high and 360 feet long was constructed in 1908 at Ellsworth at the head of tide by the Bar Harbor & Union River Power Co. The power station generating electricity for use in the vicinity and at Bangor is located on the right bank. The equipment consists of two McCormick turbines, 33-inch and 36-inch, two runners on each wheel; an 18-inch single-runner wheel used for the exciters; two alternating-current generators, of 1,000 and 1,250 kilowatts, connected to the turbines; and two direct-current exciters of 75 kilowatts each, connected to the exciter wheel; only one of these being run at a time, however. The plant is run 24 hours a day, and there is no auxiliary steam power. The turbines were rated at the Holyoke testing flume.

The crest of the dam is very even. At times flashboards are used. The head of water at this plant ranges from 50 to 62 feet, and the tide seems to affect the tailrace readings 0.7 foot. Water can pass this gaging station over the dam, through the sluice gates (each 5 feet in diameter), at the base of the dam, through the wheels, through a

6-inch pipe reduced to 4-inch (used for cooling transformers), and through the waste weir and wasteway leading from the forebay.

A very complete daily record has been kept at this station since September 2, 1908. The pond and tailrace gages are read four times a day, at high tide and low tide. The gate openings and power readings are made hourly. A note is made when flashboards are put in place and of the time and amount of sluice-gate openings. The wasteway seldom carries any water.

A number of discharge measurements have been made at the highway bridge a short distance below the dam, for use in computing daily discharge, but the computations have not been made as more wheel tests are necessary at low heads to satisfactorily complete the record. The discharge measurements are referred to a reference point used to measure the distance to the water surface. The reference point is a white paint spot on the lower part of the downstream guard rail of the bridge, 15.8 feet from the right-hand iron post.

The drainage area at Ellsworth is 537 square miles.

GREEN LAKE AT GREEN LAKE, MAINE.

Green Lake is situated in the towns of Dedham and Ellsworth, about half its length and half its area being in each town. It lies in a general northwest-southeast direction, is nearly 6½ miles long, and broadens out about three-fourths of a mile at each end into a sort of basin about 1¼ miles wide. Its elevation is about 156 feet above sea level and the top of the dam at the north side of the gates is about 4 feet higher.

Most of the short inflowing streams drain small ponds. The stream entering the northwest end of the lake flows from Goose Pond, which has an area of 0.32 square mile, lies at an elevation of 307 feet above sea level, or 141 feet above the lake, and is distant from it about 3 miles. This stream is joined on its way to the lake by several other streams, and also receives the high-water overflow of Phillips Lake.

Brooks from Little Rocky Pond and Duck Pond enter on the southern shore, about 1½ miles from the western end of the pond and near each other. Little Rocky Pond covers an area of 0.10 square mile and is at an elevation of 229 feet above sea level, 73 feet above the lake, and about half a mile from it. Duck Pond, about one-eighth mile from the lake, lies 170 feet above sea level, or 14 feet above the lake, and covers an area of 0.08 square mile.

On the northern shore three streams enter—one about a mile from the western end; the second, the outlet of Burnt, Rocky, and Mountain ponds, about midway; and the third, the outlet of Muddy Pond, at Northeast Cove. Burnt Pond is 230 feet above sea level and is 0.11 square mile in area; Rocky Pond is 206 feet above sea level and 0.20 square mile in area. Muddy Pond is practically a marsh.

A station was established near Green Lake railroad station in the town of Dedham at the northwest end of the lake on July 1, 1909, to determine the height of the lake. The staff gage is fastened to the log abutment of the highway bridge about 600 feet from the railroad station.

The record at this station simply shows the fluctuations of the lake level and the station is not used for discharge measurements. The cooperative observer is Mr. H. F. Lord, of Green Lake, Maine.

Daily gage height, in feet, of Green Lake at Green Lake, Maine, for 1910.

[H. F. Lord, observer.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	7.25	6.7	6.3	4.2	3.0	2.5	16	.....	7.1	6.75	5.3	3.6	2.7	2.1
2	.....	7.25	6.7	6.25	4.1	2.9	2.5	17	.....	7.0	6.7	5.2	3.6	2.7	2.1
3	.....	7.2	6.7	6.2	4.1	2.9	2.5	18	.....	7.0	6.7	5.1	3.6	2.6	.....
4	.....	7.3	6.9	6.1	4.1	2.9	2.4	19	7.5	7.0	6.75	5.1	3.5	2.6	.....
5	.....	7.3	7.0	6.1	4.1	2.9	2.4	20	7.5	6.95	6.7	5.1	3.5	2.5	.....
6	.....	7.3	7.0	6.0	4.0	2.9	2.3	21	7.5	6.9	6.7	5.0	3.4	2.5	.....
7	.....	7.3	7.0	5.9	4.0	2.9	2.3	22	7.4	6.9	6.6	4.9	3.4	2.5	.....
8	.....	7.3	7.0	5.9	4.0	2.85	2.3	23	7.4	6.9	6.6	4.8	3.3	2.5	.....
9	.....	7.3	6.95	5.8	3.9	2.85	2.3	24	7.4	6.9	6.55	4.7	3.2	2.5	.....
10	.....	7.3	6.9	5.7	3.9	2.8	2.3	25	7.4	6.85	6.5	4.7	3.2	2.5	.....
11	.....	7.2	6.9	5.6	3.8	2.8	2.2	26	7.4	6.85	6.5	4.6	3.1	2.5	1.8
12	.....	7.2	6.85	5.5	3.8	2.8	2.2	25	7.35	6.8	6.5	4.5	3.1	2.5	.....
13	.....	7.2	6.8	5.4	3.7	2.8	2.2	28	7.35	6.8	6.5	4.4	3.1	2.4	1.8
14	.....	7.1	6.8	5.4	3.7	2.8	2.2	29	7.3	6.75	6.4	4.3	3.1	2.4	.....
15	.....	7.1	6.75	5.3	3.6	2.7	2.2	30	7.3	6.75	6.4	4.3	3.1	2.5	.....
								31	.....	6.75	6.3	.....	3.1	.....	.....

GREEN LAKE STREAM AT LAKEWOOD, MAINE.

This station, which is located at a highway bridge in Lakewood, about half a mile downstream from the dam on Green Lake and 8 miles from Ellsworth, was established July 2, 1909.

The staff gage is fastened to the right-hand abutment of the bridge. Its datum has remained unchanged. A fair discharge rating curve has been developed and applied to 1909 and 1910 gage heights.

The station is maintained in cooperation with the State of Maine

Discharge measurements of Green Lake Stream at Lakewood, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 11	F. E. Pressey	34	59	2.92	80
Mar. 8	.....do	36	78	3.70	331
June 1	W. E. Parsons	38	63	2.90	110
July 27	.....do	32	47	2.70	50
Aug. 30	.....do	38	49	2.70	48

Daily gage height, in feet, of Green Lake Stream at Lakewood, Maine, for 1910.

[Martin A. Garland, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.98	3.35	3.05	3.30	3.52	2.98	2.75	2.70	3.00	2.65	2.70	3.20
2	2.95	3.35	3.35	3.30	3.50	2.95	2.75	2.70	3.00	2.65	2.70	3.20
3	2.92	3.35	3.05	3.30	3.50	2.92	2.75	2.70	3.00	2.65	2.70	3.20
4	2.90	3.35	3.00	3.28	3.50	2.90	2.75	2.70	2.95	2.65	2.70	3.20
5	2.90	3.35	3.00	3.28	3.50	2.90	2.75	2.75	2.90	2.65	2.70	3.20
6	2.90	3.35	3.05	3.25	3.50	2.90	2.75	2.78	2.90	2.65	2.70	3.20
7	2.90	3.32	3.50	3.25	3.45	2.90	2.75	2.78	3.40	2.65	2.70	3.20
8	2.90	3.30	3.70	3.22	3.40	2.90	2.75	2.78	3.40	2.65	2.70	3.20
9	2.90	3.28	3.80	3.22	3.38	2.90	2.78	2.78	3.40	2.65	2.70	3.15
10	2.90	3.25	3.80	3.20	3.32	2.88	2.80	2.78	3.40	3.20	2.70	3.10
11	2.90	3.25	3.75	3.20	3.30	2.88	2.80	2.75	3.10	3.15	2.70	3.05
12	2.90	3.25	3.75	3.18	3.25	2.85	2.80	2.75	3.10	3.00	2.70	3.00
13	2.90	3.25	3.60	3.12	3.18	2.85	2.80	2.72	3.10	3.00	2.70	3.00
14	2.90	3.22	3.55	3.10	3.15	2.82	2.78	2.72	3.10	2.98	2.70	2.98
15	2.90	3.22	3.50	3.08	3.10	2.80	2.78	2.70	3.10	2.95	2.70	2.98
16	2.90	3.20	3.45	3.05	3.10	2.80	2.78	2.70	3.10	2.92	2.70	2.95
17	2.88	3.20	3.45	3.02	3.05	2.80	2.75	2.70	3.10	2.92	2.70	2.95
18	2.85	3.18	3.40	3.00	3.05	2.80	2.72	2.70	3.10	2.90	2.70	2.95
19	2.85	3.15	3.35	3.15	3.02	2.80	2.72	2.70	3.10	2.90	2.70	2.95
20	2.85	3.15	3.30	3.15	3.02	2.80	2.72	2.70	3.10	2.90	2.68	2.95
21	2.88	3.12	3.30	3.20	3.00	2.78	2.70	2.70	3.08	2.90	2.68	2.92
22	3.00	3.12	3.25	3.25	3.00	2.78	2.70	2.70	3.08	2.88	2.65	2.90
23	3.20	3.10	3.20	3.30	3.00	2.78	2.70	2.70	3.08	2.85	2.65	2.90
24	3.20	3.08	3.20	3.35	3.00	2.78	2.70	2.90	3.08	2.82	2.65	2.40
25	3.20	3.05	3.20	3.38	3.00	2.78	2.70	2.90	3.08	2.80	2.65	2.40
26	3.20	3.05	3.20	3.40	3.00	2.75	2.70	2.90	3.08	2.80	2.65	2.40
27	3.25	3.05	3.20	3.50	3.00	2.75	2.70	2.90	3.08	2.80	2.65	2.40
28	3.30	3.08	3.20	3.50	3.00	2.75	2.70	2.70	3.00	2.75	2.62	2.40
29	3.30	.....	3.20	3.55	3.00	2.75	2.70	2.70	3.00	2.72	2.62	2.40
30	3.40	.....	3.20	3.55	3.00	2.75	2.70	2.70	3.00	2.70	2.60	2.40
31	3.38	.....	3.20	.....	3.00	.....	2.70	3.00	.....	2.70	.....	2.40

NOTE.—Gage heights at this station not affected by ice during 1910.

Daily discharge, in second-feet, of Green Lake Stream at Lakewood, Maine, for 1909–10.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.							1909.						
1	38	47	177	26	16	16	16	38	59	96	21	12	96
2	38	47	177	26	16	19	17	44	59	92	21	12	119
3	38	47	177	26	16	28	18	47	59	86	19	10	119
4	44	47	177	26	16	24	19	47	59	81	19	7	119
5	44	47	171	26	16	19	20	47	59	77	19	7	114
6	44	47	171	24	16	28	21	47	59	77	19	7	108
7	44	47	162	24	16	38	22	47	146	74	24	7	101
8	38	146	162	24	13	44	23	47	331	74	24	7	96
9	38	146	146	24	13	56	24	47	310	74	24	7	96
10	38	141	146	24	13	70	25	47	288	74	24	19	96
11	38	141	119	24	12	70	26	47	44	74	24	16	96
12	38	44	108	21	12	77	27	47	44	86	21	12	96
13	38	44	96	21	12	81	28	47	44	146	19	12	96
14	38	44	96	21	12	86	29	47	44	162	18	13	96
15	38	59	96	21	12	92	30	47	177	96	18	16	96
							31	47	177	.....	16	.....	96

Daily discharge, in second-feet, of Green Lake Stream at Lakewood, Maine, for 1909–10—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	92	194	108	177	256	92	56	49	96	44	49	146
2	86	194	194	177	248	86	56	49	96	44	49	146
3	81	194	108	177	248	81	56	49	96	44	49	146
4	77	194	96	171	248	77	56	49	86	44	49	146
5	77	194	96	171	248	77	56	56	77	44	49	146
6	77	194	108	162	248	77	56	59	77	44	49	146
7	77	184	248	162	230	77	56	59	211	44	49	146
8	77	177	331	152	211	77	56	59	211	44	49	146
9	77	171	376	152	204	77	59	59	211	44	49	132
10	77	162	376	146	184	74	62	59	211	146	49	119
11	77	162	354	146	177	74	62	56	119	132	49	108
12	77	162	354	141	162	70	62	56	119	96	49	96
13	77	162	288	124	141	70	62	52	119	96	49	96
14	77	152	268	119	132	65	59	52	119	92	49	92
15	77	152	248	114	119	62	59	49	119	86	49	92
16	77	146	230	108	119	62	59	49	119	81	49	86
17	74	146	230	101	108	62	56	49	119	81	49	86
18	70	141	211	96	108	62	52	49	119	77	49	86
19	70	132	194	132	101	62	52	49	119	77	49	86
20	70	132	177	132	101	62	52	49	119	77	47	86
21	74	124	177	146	96	59	49	49	114	77	47	81
22	96	124	162	162	96	59	49	49	114	74	44	77
23	146	119	146	177	96	59	49	49	114	70	44	77
24	146	114	146	194	96	59	49	77	114	65	44	19
25	146	108	146	204	96	59	49	77	114	62	44	19
26	146	108	146	211	96	56	49	77	114	62	44	19
27	162	108	146	248	96	56	49	77	114	62	44	19
28	177	114	146	248	96	56	49	49	96	56	40	19
29	177	.....	146	268	96	56	49	49	96	52	40	19
30	211	.....	146	268	96	56	49	49	96	49	38	19
31	204	.....	146	.....	96	.....	49	96	.....	49	.....	19

NOTE.—Daily discharge for 1909 and 1910 determined from a discharge rating curve fairly well defined above 40 second-feet; below this point the curve is not well defined.

There was probably no backwater from ice during 1909 and 1910.

Monthly discharge of Green Lake Stream at Lakewood, Maine, for 1909–10.

[Drainage area, 47 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1909.						
July	47	38	43.0	0.915	1.05	B.
August	331	44	98.5	2.10	2.42	B.
September	177	74	118	2.51	2.80	B.
October	26	16	22.2	.472	.54	C.
November	19	7	12.5	.266	.30	D.
December	119	16	77.0	1.64	1.89	B.
1910.						
January	211	70	104	2.21	2.55	B.
February	194	108	152	3.23	3.36	B.
March	376	96	202	4.30	4.96	B.
April	268	96	166	3.53	3.94	B.
May	256	96	150	3.19	3.68	B.
June	92	56	67.4	1.43	1.60	B.
July	62	49	54.3	1.16	1.34	B.
August	96	49	56.6	1.20	1.38	B.
September	211	77	122	2.60	2.90	B.
October	146	44	68.2	1.45	1.67	B.
November	49	38	46.9	.998	1.11	B.
December	146	19	87.7	1.87	2.16	B.
The year	376	19	106	2.26	30.65	

BRANCH LAKE NEAR ELLSWORTH, MAINE.

Branch Lake lies in the town of Ellsworth, Maine, with its longer axis northwest-southeast. It is considered locally as consisting of three parts—the Mill Pond and the Lower and Upper lakes. The Mill Pond is formed by the dam at the lower end of the lake and is about 0.7 mile long and one-eighth mile in average width. It is connected with the Lower Lake by a narrow channel known as the "Outlet." The Lower Lake is about 2½ miles long and 0.6 mile in average width, and is connected with the Upper Lake by a comparatively narrow passage known as the "Narrows." The Upper Lake, 2½ miles long, widens out above the Narrows and attains its maximum width—nearly 2½ miles—at its extreme upper end. The total area of Branch Lake is 4.33 square miles. The total length of all three parts along what would be called the natural center line of the lake, which extends from the mouth of Dean Brook to the dam at the Mill Pond, is 5.9 miles; from the head of McGowans Cove to the dam the distance is 6.9 miles.

The elevation of the lake, as determined by the United States Geological Survey, is 236 feet above sea level, and this height was assumed as the height of the water surface at the time of the Union River survey reconnaissance. On this assumption the top of the dam is 240 feet above sea level. In most places the rise of the land is gradual and uniform, there being no lowland except at the northwest end around Lincompaw Brook. The 240-contour on the map represents a level about 30 feet back from the present lake, and the 250-foot is not far distant.

The shores are wooded to the water's edge, the growth being from 15 to 20 years' stand and comprising both hard and soft wood.

No large streams flow into the lake. Great Brook, which enters on the east shore of the lower lake, is about 2 miles long. At the head of the lake several streams enter, none being over 4 miles long. The largest, Lincompaw Brook, is the outlet of Harriman Pond, a pond 0.10 square mile in area and lying at an elevation of 536 feet above sea level, or 300 feet above Branch Lake. Rocky Pond, which has an area of 0.25 square mile and is situated about a mile from the lake and 117 feet above it, sends down a stream that enters on the south side, near the head of the lake.

In connection with the survey of the Union River basin, which was carried on in cooperation with the State of Maine, a station was established on the lake June 29, 1909.

The lake levels are taken on an 8½-foot staff gage nailed to the corner of the Branch Pond Lumber Co.'s mill near the intake of the wheels.

The gage readings indicate the height of the lake. No change has been made in the gage datum.

See also description for Branch Lake Stream near Ellsworth.

Daily gage height, in feet, of Branch Lake near Ellsworth, Maine, for 1910.

[H. B. Moor, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.5	7.45	7.5	7.8	8.3	7.2	6.15	5.2	4.4	3.65	2.5	1.75
2	6.5	7.45	7.55	7.75	8.3	7.15	6.1	5.15	4.3	3.65	2.5	1.75
3	6.45	7.45	7.6	7.75	8.25	7.1	6.05	5.15	4.3	3.6	2.5	1.8
4	6.45	7.45	7.6	7.75	8.25	7.05	6.05	5.15	4.3	3.55	2.5	1.8
5	6.45	7.5	7.55	7.8	8.2	7.0	6.0	5.1	4.2	3.5	2.45	1.8
6	6.45	7.5	7.55	7.8	8.2	6.95	5.95	5.1	4.15	3.5	2.4	1.8
7	6.45	7.55	7.65	7.8	8.15	6.9	5.95	5.2	4.15	3.5	2.35	1.8
8	6.45	7.55	8.05	7.8	8.15	6.85	5.95	5.2	4.1	3.5	2.35	1.75
9	6.45	7.55	8.1	7.8	8.1	6.8	5.9	5.2	4.1	3.5	2.35	1.75
10	6.45	7.5	8.05	7.8	8.1	6.75	5.9	5.15	4.1	3.5	2.3	1.75
11	6.45	7.5	8.0	7.8	8.05	6.75	5.9	5.15	4.1	3.5	2.3	1.75
12	6.45	7.5	8.0	7.75	8.0	6.7	5.9	5.1	4.1	3.45	2.25	1.7
13	6.45	7.5	8.0	7.75	7.9	6.7	5.85	5.05	4.1	3.45	2.2	1.7
14	6.45	7.5	7.9	7.7	7.85	6.7	5.8	5.05	4.05	3.35	2.2	1.65
15	6.4	7.5	7.85	7.7	7.85	6.65	5.75	5.0	4.05	3.2	2.2	1.65
16	6.4	7.45	7.85	7.65	7.8	6.6	5.65	4.95	4.05	3.15	2.2	1.65
17	6.4	7.45	7.85	7.65	7.75	6.55	5.65	4.95	4.05	3.1	2.2	1.65
18	6.4	7.45	7.8	7.65	7.7	6.55	5.6	4.9	4.05	3.05	2.15	1.65
19	6.4	7.45	7.8	7.65	7.7	6.55	5.6	4.85	4.0	3.0	2.1	1.6
20	6.4	7.45	7.8	7.7	7.7	6.5	5.55	4.8	3.9	2.95	2.05	1.6
21	6.6	7.4	7.8	7.75	7.65	6.45	5.5	4.8	3.9	2.9	2.0	1.6
22	6.8	7.4	7.8	7.85	7.6	6.45	5.45	4.75	3.9	2.85	1.95	1.6
23	7.0	7.4	7.75	7.85	7.55	6.45	5.4	4.75	3.85	2.8	1.9	1.6
24	7.05	7.35	7.75	7.9	7.5	6.45	5.4	4.7	3.8	2.8	1.85	1.6
25	7.1	7.35	7.75	8.0	7.5	6.4	5.4	4.7	3.8	2.75	1.85	1.6
26	7.15	7.35	7.75	8.05	7.45	6.4	5.4	4.65	3.7	2.75	1.85	1.9
27	7.15	7.45	7.8	8.2	7.4	6.4	5.35	4.65	3.65	2.7	1.8	2.1
28	7.2	7.45	7.8	8.3	7.4	6.35	5.3	4.6	3.65	2.65	1.8	2.15
29	7.2	.....	7.8	8.25	7.35	6.3	5.25	4.55	3.65	2.6	1.8	2.15
30	7.3	.....	7.8	8.25	7.3	6.2	5.25	4.5	3.65	2.55	1.75	2.2
31	7.4	.....	7.8	.....	7.25	.....	5.25	4.45	.....	2.55	.....	2.25

BRANCH LAKE STREAM NEAR ELLSWORTH, MAINE.

This station, which is located at a small highway bridge about 100 feet below the mill of the Branch Pond Lumber Co., at the outlet of Branch Lake, 5 miles from Ellsworth, was established July 2, 1909, in connection with the survey of Union River made in cooperation with the State of Maine. The records indicate the amount of water flowing from the pond.

The gage readings are taken on a 7-foot staff gage nailed to the right abutment downstream side of the bridge. No change has been made in the datum of the gage since its establishment.

Discharge measurements are made from the highway bridge. The water level at this point fluctuates considerably, but fair computations of discharge can be made from the detailed readings of the time and openings of the gates of the mill wheels. The actual discharge through the wheels is not computed, and the mill records

are simply used to determine the lengths of time that the readings on the gage at the bridge apply.

The daily gage heights are not a correct index of the mean daily discharge and hence are not published.

The mill is equipped with a 3-foot and a 6-foot wheel. Ordinarily the 3-foot wheel is used 10 hours a day, the 6-foot wheel being used at irregular intervals. Water is also provided for the woolen mills 2½ miles below, the waste gates being opened during the night for a usual period of 14 hours. Record is made of the wheels and the number of hours they are run, of the gage height corresponding to the flow through the wheels, and also of the gage heights representing the water furnished to the woolen mill. In periods of low water, when neither mill is running, the discharge amounts only to the leakage through the dam and wheels.

Conditions at this station have been very unsatisfactory during 1910, and the discharge measurements plot erratically. It has been assumed the relation of gage height to discharge at this point is not materially affected by ice.

The excessive run-off depth in inches for 1910 is partially explained by the purchase of water from Branch Lake in the fall of the year by the Bar Harbor & Union River Power Co., and a resulting heavy draft on the lake storage.

The cooperative observer is Mr. H. B. Moor, Ellsworth, Maine.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of Branch Lake Stream near Ellsworth, Maine, for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 10	F. E. Pressey	24	58	3.90	27
Mar. 8	do	27	92	5.25	200
June 3	do	28	103	5.45	266
July 28	W. E. Parsons	25	76	4.70	93

Daily discharge, in second-feet, of Branch Lake Stream near Ellsworth, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	51	30	108	90	154	135	46	56	59	1	45	45
2	51	30	110	94	223	139	46	56	118	1	56	80
3	51	30	112	38	142	135	26	56	59	34	45	45
4	51	30	112	94	117	85	26	112	45	26	56	26
5	51	34	103	97	117	42	51	56	82	26	56	45
6	67	34	57	97	117	110	51	56	59	22	93	93
7	88	34	175	97	113	79	46	35	59	10	93	45
8	27	34	293	97	51	79	46	118	82	1	56	45
9	27	34	275	97	109	135	46	118	118	1	50	45
10	27	81	198	38	109	79	18	118	59	46	45	45
11	27	81	195	97	113	79	38	62	12	22	45	45
12	27	34	195	97	128	34	38	65	12	10	45	45
13	27	34	195	97	128	75	110	118	59	1	45	45
14	27	81	183	94	113	71	110	40	80	93	45	40
15	27	81	180	94	51	122	110	82	59	93	45	40
16	27	81	38	94	88	71	110	118	59	93	45	40
17	27	81	42	34	88	118	18	62	59	93	56	40
18	27	34	42	92	88	34	116	62	28	56	68	40
19	77	81	42	92	88	34	53	118	114	49	68	35
20	77	34	42	92	88	65	53	118	57	49	45	35
21	77	81	96	92	107	91	53	45	54	93	68	35
22	77	81	96	95	46	65	53	118	54	93	93	35
23	27	81	96	95	134	65	53	62	54	93	93	35
24	77	81	96	34	134	65	35	62	54	93	93	35
25	77	78	96	101	134	65	56	62	12	76	80	35
26	34	56	96	101	138	34	116	62	109	80	80	35
27	55	30	42	163	138	65	56	62	52	86	80	35
28	30	79	92	220	138	118	59	40	52	93	45	35
29	30	.....	92	217	46	65	59	62	27	96	45	35
30	30	.....	92	217	92	91	59	62	1	100	93	35
31	30	.....	92	.....	139	.....	35	62	.....	45	.....	35

NOTE.—Daily discharge computed from gage heights and observer's additional notes of time to which gage heights apply, depending on the operation of the two units at the lumber mill above. Two fairly well defined discharge rating curves have been used, one applicable for the first half of the year and the other applicable for the second half of the year.

Monthly discharge of Branch Lake Stream near Ellsworth, Maine, for 1910.

[Drainage area, 31 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	88	27	45.3	1.46	1.68	D.
February	81	30	55.7	1.80	1.87	D.
March	293	38	119	3.84	4.43	D.
April	220	34	102	3.29	3.67	D.
May	223	46	112	3.61	4.16	D.
June	139	34	81.5	2.63	2.93	D.
July	116	18	57.8	1.86	2.14	D.
August	118	35	75.0	2.42	2.79	D.
September	118	1	58.3	1.88	2.10	D.
October	100	1	54.0	1.74	2.01	D.
November	93	45	62.4	2.01	2.24	D.
December	93	26	42.1	1.36	1.57	D.
The year	293	1	72.2	2.33	31.59	

NOTE.—These estimates of discharge should be used with caution.

PENOBSCOT RIVER.[1]

GENERAL FEATURES OF AREA DRAINED.

Penobscot River is formed by the union of its East and West branches. The West, or principal branch, rises in the mountainous region of northwestern Maine, near the Canadian Boundary, and flows in a general southeasterly direction to its junction with the East Branch of the river at Medway, a distance of over 100 miles. From the mouth of the East Branch to tidewater at Bangor is about 75 miles, this latter point being 27 miles from the mouth of the river at Fort Point at the head of Penobscot Bay. The total length of the river is, therefore, about 200 miles. The drainage basin has an extreme breadth of about 115 miles and comprises 8,500 square miles, or more than one-fourth the entire State.

The important tributaries of the Penobscot in the order of their confluence from the source of the river are as follows:

Tributaries of Penobscot River.

River.	Enters Penobscot at—	Drainage area (square miles).
East Branch of Penobscot River	Medway	1,130
Mattawamkeag River	Mattawamkeag	1,500
Piscataquis River	Howland	1,500

The basin lies in general somewhat lower than that of Kennebec River, for the latter is nearer the summit of the mountain range on the western boundary of the State. As a whole, it is rather uniform in its topographic features. Hills and low mountains stretch from the region near the sea to a point above Bangor; farther north the surface is an undulating plain, and westward it becomes more broken and is generally diversified by hills, detached peaks, lakes, ponds, and swamps. The headwaters of the Kennebec, Penobscot, and St. John are all in the same vicinity, a highland region intermingled with swamps and lagoons. Mount Katahdin, the highest peak of which is 5,273 feet above mean tide and the highest mountain in the State, lies in a detached range of mountains between the West and East branches of the Penobscot.

The predominant rocks of the Penobscot basin are shales, slates, and schists. In the Mount Katahdin region and near the mouth of the river granite also occurs in considerable areas. The character of the river valley is determined largely by the prevailing rocks. Thus, for many miles above Bangor the river flows through an area where

[1] All available data pertaining to the Penobscot River drainage basin collected prior to 1910 have been assembled and published in "Water resources of the Penobscot River basin," Water-Supply Paper U. S. Geol. Survey No. 279, 1912.

the rocks are relatively soft shales, slates, and schists, and its valley here is broad. Between Hampden and Bucksport, however, where harder granites and schists are found, the valley is narrow with steep walls, and a short distance below Ripogenus Lake some of the finest river scenery in the country is found.

Chesuncook Lake lies near the center of the basin at an elevation of 930 feet above sea level. From this point to tide water the distance along the river is 126 miles, or an average fall of 7.4 feet per mile.

Nearly two-thirds of the Penobscot River basin consists of timber land. Spruce prevails, although white pine, cedar, and white birch are also produced in considerable quantities.

The mean annual precipitation ranges from about 43 inches near the coast to less than 35 inches in the northern portions, the mean for the whole basin being about 39 inches, slightly less than that of the Kennebec.

The river freezes over during the winter and snow accumulates in large quantities.

The natural storage facilities of the Penobscot, with its total lake and pond surface of 407 square miles, are surpassed only by those of the Kennebec and Androscoggin basins. On the West Branch some 30 billion cubic feet of storage in the Twin and Chesuncook Lake systems is utilized in connection with the developments of the Great Northern Paper Co., at and near Millinocket, with marked effect upon the regimen of flow. On the East Branch, Chamberlain and Allagash lakes and a number of others are capable of storing much of the flow. Mattawamkeag and Piscataquis rivers all afford good storage sites, and 80 or 90 billion cubic feet of water could probably be economically stored in the various portions of the Penobscot basin. Storage on the West Branch of the river is very efficiently controlled by the Great Northern Paper Co., but in all other localities the stored water is used only for log driving, and a systematic regulation of stored flow would be of great benefit to present and future users of power.

Log driving is an important industry on the Penobscot, and the annual drive amounts to over 200,000,000 feet b. m. The river is navigable to Bangor except during the winter months.

Considerable power has been developed on the Penobscot, notably for the pulp and paper mills at Oldtown, West Enfield, and Millinocket, but there is a very large amount of undeveloped power both on the main river and its principal tributaries.

The longest run-off record in the Penobscot basin is that at Millinocket, beginning in 1901. The driest year at that point since 1900 was 1904, and the wettest was 1902, the total flow during these two

years being in the ratio of 1 to 2.08. Storage on the West Branch has very materially changed the regimen of flow since 1901.

RIVER SURVEYS IN PENOBSCOT RIVER BASIN.

The results of river and lake surveys made in the Penobscot River basin by the United States Geological Survey in cooperation with the State of Maine are represented by maps of the following list:

River and lake maps of Penobscot River drainage area.

	Sheets.
Penobscot River, Bangor to North Twin Lake	5
West Branch of Penobscot River, Chesuncook Lake to Ambejejus Lake	3
West Branch of Penobscot River, Chesuncook Lake to Seeboomook	2
East Branch of Penobscot River, First Grand Lake to Medway	3
Chamberlain Lake, Webster Lake, Round Pond	1
Baskahegan Lake, First Grand Lake, Second Grand Lake, Allagash Lake	1
Mattawamkeag River, mouth to North Bancroft	3
Schoodic Lake, Seboois Lake, Endless Lake, Mattawamkeag Lake, Pleasant Pond	1
Piscataquis River drainage basin	11

The river maps show not only the plan of the river with 5-foot contours along the banks, but also the profiles of the rivers, and are of value in studying both developed and undeveloped water-power sites, as in connection with the stream gaging records they afford data for close estimates of the total horsepower that can be developed at the various falls and rips. The lake maps are of value in computing the capacity of the various lakes in cubic feet, if their use as storage reservoirs is contemplated.

These maps may be had without charge by applying to C. C. Babb, district engineer, United States Geological Survey, State House, Augusta, Maine.

WEST BRANCH OF PENOBSCOT RIVER AT MILLINOCKET, MAINE.

The discharge of Penobscot River at the Millinocket mill of the Great Northern Paper Co. has been computed, and the data furnished since 1901 by H. S. Ferguson, engineer for the company. The development at Millinocket was made by placing a concrete dam on the Penobscot at the outlet of Quakish Lake, a little over a mile from the mill site on Millinocket Stream, which enters the Penobscot about 4½ miles below Quakish Lake. Millinocket Stream has only a slight fall, though the main river drops some 112 feet in this vicinity, and by utilizing the former for a tailrace a head of about 110 feet has been obtained.

About 3 miles above the Quakish Lake dam is the North Twin Lake dam—a comparatively new storage dam affording about 14,500,000,000 cubic feet of storage.

Records are obtained by considering the flow through the wheels, the flow over the dam, and water used from time to time by the log sluice, filters, etc. The wheels were rated at Holyoke, Mass., before being placed in position. As the head under which they work, averaging about 110 feet, is much greater than the head under which they were tested, numerous tube-float measurements of flow in the canal leading to the mill have been made by Mr. Ferguson, in order to determine just how much water the mill used under different conditions of gate openings. In addition to this, during 1904, a series of current-meter measurements were made by the United States Geological Survey to check results as obtained by the floats and to obtain a suitable coefficient for use with the float measurements. It is believed that by means of these various checks on the measurements a very good estimate has been made of the flow through the wheels.

An automatic recording gage of the Friez type is installed at the Quakish Lake dam and flow is computed by the formula $Q=cbh^{\frac{3}{2}}$, in which c is a variable coefficient obtained (1) from the results of weir measurements made by Mr. Ferguson on a 10-foot portion of the dam, and (2) from a study of the results of experiments made by George W. Rafter at the Cornell testing flume.

When the flow of the river is less than 2,500 second-feet all the water is generally used through the mill; flow over the flashboards, which are used much of the time, is computed by use of the formula $Q=3.33\ bh^{\frac{3}{2}}$. The Quakish Lake dam is at an elevation of 456.3 feet above mean sea level, as determined by the Penobscot River survey of 1904.

Several storage dams, including the North Twin dam previously mentioned, which have been constructed at points in the basin above this mill, store water on a surface of about 65 square miles, with a capacity of about 30,000,000,000 cubic feet. Except during the time (usually in August) that excess water has to be supplied for log driving on the river below Millinocket and for a short time in the spring, the run-off is regulated by storage. Further storage capacity, sufficient to practically control the run-off from the drainage area above Millinocket, is contemplated by the Great Northern Paper Co. Millinocket Lake is now being used for power storage at the new mills of the company at East Millinocket and Dolby. It has been utilized for log driving for many years in the past.

The records of discharge at Millinocket are under the personal supervision of Mr. Ferguson, are carefully kept, and are rated as excellent. No difficulty is experienced in winter on account of ice affecting the estimates of discharge or the running of the wheels. Ferguson Pond, just above the entrance to the canal, eliminates effect from anchor ice.

The maximum daily discharge since the beginning of the records occurred April 1 and 2, 1903, and was a flow of 24,250 second-feet. The minimum weekly discharge at this point, not considering periods when water was not in use at the mill, was 291 second-feet, occurring January 28 to February 3, 1904.

The Millinocket mill of the Great Northern Paper Co., with nearly 25,000 horsepower of wheel installation, has a daily output of about 300 tons of pulp and 300 tons of paper, and is doubtless the largest mill in the world. At East Millinocket and Dolby, about 10 miles down river, are other mills of this company, constructed during 1907, and utilizing over 15,000 horsepower of wheels, with a daily capacity of about 180 tons of pulp and 130 tons of paper. This is, therefore, an important district in the manufacture of pulp and paper.

Data prior to 1910 have been compiled in Water-Supply Paper 279.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of West Branch of Penobscot River at Millinocket, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,173	2,120	4,350	3,155	[a]1,940	6,455	3,980	1,750	2,650	2,205	2,265	2,265
2	[a]2,189	2,130	4,280	3,155	1,492	6,146	3,975	2,250	2,605	[a]2,265	2,260	2,265
3	2,175	2,160	4,287	[a]3,180	2,350	4,660	[a]4,680	2,255	2,605	2,025	2,260	2,265
4	2,173	2,120	4,275	2,760	1,900	5,390	3,950	2,260	[a]2,635	2,260	2,260	[a]2,230
5	2,237	2,155	4,085	2,735	5,270	[a]6,075	4,075	2,255	2,795	2,265	2,250	1,870
6	2,213	[a]2,182	[a]4,137	2,691	9,290	6,225	4,280	2,255	2,795	2,265	[a]2,255	2,265
7	2,174	3,975	4,263	2,679	10,465	7,445	4,135	[a]2,200	2,370	2,265	1,030	2,265
8	2,237	4,870	4,195	2,735	[a]9,090	7,460	3,255	1,535	2,255	2,265	2,260	2,160
9	[a]2,237	5,280	4,083	2,810	8,700	6,565	2,985	2,260	2,260	[a]2,275	2,255	2,265
10	2,092	5,385	4,208	[a]2,868	8,650	6,820	[a]2,735	2,255	2,260	2,045	2,250	2,255
11	2,238	5,260	4,278	2,849	8,110	8,165	2,290	2,260	[a]2,260	2,260	2,265	[a]2,240
12	2,139	5,130	4,320	2,940	6,925	[a]6,220	2,890	2,260	2,035	2,260	2,265	1,970
13	2,161	[a]5,140	[a]4,340	2,820	6,865	4,690	2,675	2,250	2,265	2,260	[a]2,255	2,240
14	2,214	4,735	4,441	2,330	6,890	4,780	2,610	[a]2,255	2,265	2,260	1,240	2,220
15	2,238	4,685	4,258	2,240	[a]6,920	5,775	2,560	1,830	2,230	2,265	2,260	2,025
16	[a]2,238	4,610	4,260	2,250	6,320	4,890	2,409	2,255	2,170	[a]2,260	2,265	2,265
17	2,218	4,555	4,360	[a]2,260	5,800	4,785	[a]2,425	2,370	2,255	2,025	2,265	2,265
18	2,151	4,480	4,475	2,035	4,590	4,720	2,184	2,615	[a]2,220	2,260	2,265	[a]2,265
19	2,191	4,410	4,360	2,210	4,010	[a]5,165	2,316	2,610	2,055	2,260	2,260	1,810
20	2,186	[a]4,300	[a]4,345	2,245	4,775	4,000	2,273	2,250	2,265	2,260	[a]2,260	2,265
21	2,181	4,250	4,476	2,240	5,200	3,530	2,321	[a]2,265	2,265	2,260	1,840	1,960
22	1,937	4,235	4,235	2,245	[a]5,230	4,040	2,365	1,710	2,250	2,260	2,260	2,015
23	[a]1,988	4,290	4,195	2,250	4,775	4,780	2,352	2,250	2,505	[a]2,280	2,270	2,265
24	1,810	4,320	4,135	[a]2,350	4,130	4,790	[a]2,303	2,150	2,600	1,845	2,265	2,165
25	1,835	4,365	4,147	2,090	3,970	5,060	2,949	2,295	[a]2,640	2,260	2,260	[a]2,010
26	2,190	4,305	3,562	2,190	4,530	[a]4,070	2,250	2,550	2,035	2,260	2,265	1,795
27	1,992	[a]4,215	[a]3,348	2,250	4,030	3,790	2,250	2,745	2,265	2,265	[a]2,270	1,740
28	2,185	4,210	2,870	2,315	4,260	5,900	2,250	[a]2,725	2,180	2,260	1,695	2,250
29	2,063	.....	3,045	2,224	[a]6,650	5,230	2,250	2,440	2,200	2,260	2,225	2,180
30	[a]1,962	.....	2,925	2,265	7,125	3,820	2,250	3,315	2,255	[a]2,260	2,265	2,145
31	2,143	.....	3,075	.....	6,625	.....	[a]2,260	2,715	.....	1,770	.....	2,255

[a] Sunday.

Monthly discharge of West Branch of Penobscot River at Millinocket, Maine, for 1910.

[Drainage area, 1,880 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	2,238	1,810	2,134	1.14	1.31
February	5,385	2,120	4,067	2.16	2.25
March	4,476	2,870	4,052	2.16	2.49
April	3,180	2,035	2,512	1.34	1.50
May	10,465	1,492	5,706	3.03	3.49
June	8,165	3,530	5,381	2.86	3.19
July	4,280	2,184	2,854	1.52	1.75
August	3,315	1,535	2,305	1.23	1.42
September	2,795	2,035	2,348	1.25	1.40
October	2,280	1,770	2,209	1.18	1.36
November	2,270	1,030	2,152	1.14	1.27
December	2,265	1,740	2,144	1.14	1.31
The year	10,465	1,030	3,148	1.68	22.74

PENOBSCOT RIVER AT WEST ENFIELD, MAINE.

This station, which is located at the steel highway bridge about 1,000 feet below the mouth of Piscataquis River and 1 mile below West Enfield, was established November 5, 1901, and prior to 1904 was designated as being at Montague, Maine. In 1904 the name of this village was changed to West Enfield.

There is a dam on Piscataquis River near its entrance into the Penobscot, and about a mile above the station is the dam of the International Paper Co., on the main river. During low water daily gage heights show considerable fluctuations caused by variations in wheel-gate openings at the mills above.

The datum of the chain gage has remained the same during the maintenance of the station.

Discharge measurements are made from the bridge.

During the winter months the discharge is affected by ice. Conditions for obtaining accurate discharge data during the open-water season are good, and a fairly good discharge rating curve has been developed for 1910. The plotting of discharge measurements at this station indicates considerable variation in the conditions of flow from year to year, thus requiring new discharge rating curves after each high-water period.

The regimen of flow of Penobscot River has been considerably affected by storage, principally in the lakes tributary to the West Branch, since about 1900.

Data prior to 1910 have been compiled in Water-Supply Paper 279.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of Penobscot River at West Enfield, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 24[a]	F. E. Pressey	868	5,000	5.40	10,400
Apr. 27	H. S. Boardman	886	9,360	10.02	33,600
May 25	F. E. Pressey	860	4,810	5.00	11,200
Sept. 29	University of Maine students, under direction of Prof. H. S. Boardman	658	2,530	2.22	3,900
29	do	658	2,520	2.22	3,750
Oct. 1	do	645	2,460	2.15	3,510
1	do	645	2,450	2.15	3,300
5	do	641	2,480	2.10	3,570
5	do	641	2,400	2.10	2,700
8	do	631	2,390	2.03	3,460
8	do	631	2,360	2.03	3,310
13	do	658	2,550	2.22	3,930
15	do	634	2,400	2.04	3,360
15	do	634	2,420	2.04	3,370
18	do	603	2,160	1.68	3,650
18	do	603	2,160	1.68	2,590
19	do	628	2,350	1.99	3,300
19	do	628	2,360	1.99	3,100
28	do	705	2,750	2.71	4,860
Nov. 2	do	685	2,700	2.48	4,580
2	do	685	2,720	2.48	4,280

[a] Backwater due to ice jam.

Daily gage height, in feet, of Penobscot River at West Enfield, Maine, in 1910.

[A. H. Hanson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.9	8.2	7.05	8.25	8.6	7.15	5.75	2.65	3.3	2.1	2.15	2.3
2	4.9	7.8	7.2	9.2	8.35	7.9	5.55	2.9	3.25	2.15	2.35	2.4
3	4.9	7.35	7.3	9.5	8.05	6.95	5.4	3.1	2.9	2.05	2.4	2.4
4	4.95	7.15	7.25	9.5	8.45	6.65	5.4	3.25	2.8	2.0	2.3	2.55
5	4.9	6.85	7.2	9.2	9.05	6.5	5.65	3.6	2.85	2.1	2.3	2.65
6	4.9	7.1	7.05	9.45	9.3	6.45	5.95	3.85	3.0	2.05	2.2	2.5
7	5.7	7.2	7.0	10.1	9.25	6.7	6.25	3.65	2.9	2.0	2.35	2.9
8	5.7	7.25	7.3	10.6	9.0	7.0	6.5	3.5	2.75	2.3	2.75	2.9
9	5.6	7.25	7.75	10.35	8.6	7.05	5.35	3.4	2.6	2.0	3.0	2.85
10	5.7	7.1	7.85	9.95	8.25	6.85	5.0	3.25	2.5	1.9	2.9	2.85
11	5.8	7.0	7.5	9.45	7.95	6.65	4.3	3.2	2.4	1.65	2.8	2.9
12	5.8	6.9	7.15	9.2	7.75	6.55	4.0	3.1	2.3	1.95	2.7	2.8
13	5.7	6.8	6.8	8.6	7.45	6.5	4.05	3.1	2.25	2.2	2.6	2.15
14	5.6	6.9	6.45	8.05	7.2	6.7	3.85	3.2	2.4	2.25	2.6	2.7
15	5.7	7.0	6.3	7.55	6.75	6.35	3.65	3.1	2.55	2.1	2.45	2.7
16	5.6	6.9	6.2	7.2	7.45	6.15	3.3	3.2	2.4	2.05	2.25	3.0
17	5.45	6.9	6.15	6.8	6.3	6.1	3.0	3.15	2.4	1.95	2.6	3.1
18	5.4	6.8	6.0	6.25	6.15	6.6	2.6	3.1	2.25	1.75	2.6	3.1
19	5.5	7.05	6.2	6.15	6.0	6.95	2.85	3.2	2.0	2.0	2.45	2.95
20	5.5	7.05	6.45	7.0	6.1	6.75	3.1	3.3	2.2	2.05	2.15	2.55
21	5.4	7.0	6.65	7.85	6.1	6.6	3.1	3.25	2.4	2.0	2.0	2.85
22	5.5	6.55	6.75	8.45	5.85	6.5	3.2	3.45	2.3	2.0	2.15	2.75
23	7.7	7.75	6.45	9.05	5.6	6.65	3.25	3.4	2.3	1.7	2.3	2.6
24	10.3	6.9	5.45	9.25	5.4	6.45	2.8	3.5	2.3	1.75	2.3	2.55
25	9.85	6.9	5.5	9.45	5.45	6.1	2.4	3.4	2.15	1.6	2.25	2.8
26	9.4	7.0	6.0	9.7	6.1	5.9	2.75	3.4	2.1	2.2	2.3	2.
27	9.95	6.9	6.3	10.05	6.4	6.0	3.2	3.45	2.15	2.45	2.2	2.9
28	9.5	6.75	6.3	10.8	6.5	6.1	3.2	3.45	2.3	2.75	2.1	2.9
29	9.1	.....	6.35	9.9	6.6	6.25	3.25	3.4	2.3	2.5	2.2	2.85
30	8.7	.....	6.75	9.15	6.7	6.4	3.15	3.4	2.2	2.35	2.35	3.75
31	8.45	.....	7.7	.....	6.85	.....	2.95	3.2	.....	2.05	.....	4.05

NOTE.—Ice existed from Jan. 1 to Apr. 1 and from about Dec. 4 to 23. During much of the time in these two periods the river was open at the gage, but backwater was caused by the collection of ice on bars below. The thickness of ice at the gage during January and February varied from about 0.2 foot to 1.0 foot. Gage heights during the winter months were probably read to water surface.

Daily discharge, in second-feet, of Penobscot River at West Enfield, Maine, for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	a21,800	26,000	19,100	13,500	4,620	6,140	3,430	3,530	3,840
2	29,300	24,700	22,500	12,800	5,190	6,020	3,530	3,950	4,060
3	31,000	23,200	18,200	12,300	5,650	5,190	3,330	4,060	4,060
4	31,000	25,200	17,000	12,300	6,020	4,960	3,230	3,840	.....
5	29,300	28,500	16,400	13,200	6,910	5,080	3,430	3,840	.....
6	30,700	29,800	16,200	14,300	7,580	5,420	3,330	3,630	.....
7	34,400	29,600	17,200	15,400	7,040	5,190	3,230	3,950	.....
8	37,400	28,200	18,400	16,400	6,650	4,840	3,840	4,840	.....
9	36,000	26,000	18,600	12,100	6,390	4,500	3,230	5,420	.....
10	33,600	24,200	17,800	11,000	6,020	4,280	3,040	5,190	.....
11	30,700	22,700	17,000	8,830	5,890	4,060	2,560	4,960	.....
12	29,300	21,800	16,600	7,980	5,650	3,840	3,140	4,730	.....
13	26,000	20,400	16,400	8,120	5,650	3,740	3,630	4,500	.....
14	23,200	19,300	17,200	7,580	5,890	4,060	3,740	4,500	.....
15	20,800	17,400	15,800	7,040	5,650	4,390	3,430	4,170	.....
16	19,300	20,400	15,000	6,140	5,890	4,060	3,330	3,740	.....
17	17,600	15,600	14,800	5,420	5,770	4,060	3,140	4,500	.....
18	15,400	15,000	16,800	4,500	5,650	3,740	2,760	4,500	.....
19	15,000	14,400	18,200	5,080	5,890	3,230	3,230	4,170	.....
20	18,400	14,800	17,400	5,650	6,140	3,630	3,330	3,530	.....
21	22,200	14,800	16,800	5,650	6,020	4,060	3,230	3,230	.....
22	25,200	13,900	16,400	5,890	6,520	3,840	3,230	3,530	.....
23	28,500	13,000	17,000	6,020	6,390	3,840	2,660	3,840	.....
24	29,600	12,300	16,200	4,960	6,650	3,840	2,760	3,840	4,390
25	30,700	12,500	14,800	4,060	6,390	3,530	2,470	3,740	4,960
26	32,100	14,800	14,100	4,840	6,390	3,430	3,630	3,840	4,960
27	34,200	16,000	14,400	5,890	6,520	3,530	4,170	3,630	5,190
28	38,600	16,400	14,800	5,890	6,520	3,840	4,840	3,430	5,190
29	33,300	16,800	15,400	6,020	6,390	3,840	4,280	3,630	5,080
30	29,000	17,200	16,000	5,770	6,390	3,630	3,950	3,950	7,300
31	.....	17,800	.....	5,300	5,890	.....	3,330	.....	8,120

a Discharge estimated; ice present.

NOTE.—Daily discharge obtained from a well-defined discharge rating curve.

Monthly discharge of Penobscot River at West Enfield, Maine, for 1910.

[Drainage area, 6,600 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	7,400	1.12	1.29	D.
February	.....	.....	8,600	1.30	1.35	D.
March	.....	.....	11,800	1.79	2.06	D.
April	38,600	15,000	27,800	4.21	4.70	A.
May	29,800	12,300	19,800	3.00	3.46	A.
June	22,500	14,100	16,800	2.55	2.84	A.
July	16,400	4,060	8,380	1.27	1.46	A.
August	7,580	4,620	6,140	.930	1.07	A.
September	6,140	3,230	4,260	.645	.72	A.
October	4,840	2,470	3,370	.511	.59	A.
November	5,420	3,230	4.070	.617	.69	A.
December	8,120	.....	4,000	.606	.70	C.
The year	38,600	2,470	10,200	1.55	20.93	

NOTE.—The mean monthly discharge for January, February, March, and December has been determined from the summation of the discharge at the four stations above West Enfield, namely, Millinocket, Grindstone, Mattawamkeag, and Foxcroft, plus an inflow below these 4 stations and above West Enfield. This inflow has been assumed equal to about the average rate of run-off per square mile above the Foxcroft and Mattawamkeag stations.

Mean discharge Dec. 4 to 23 estimated 3,340 second-feet.

This table supersedes tables published in the first annual report of the Maine State Water Storage Commission.

EAST BRANCH OF PENOBSCOT RIVER AT GRINDSTONE, MAINE.

The East Branch of the Penobscot originally had its headwaters in Webster and East Branch streams, in the north-central part of Maine, but since 1845 about 270 square miles of additional territory, draining to Chamberlain Lake, has contributed in part to the flow of this stream, as explained in more detail in the description of the St. John drainage basin (p. 27). The basin of the East Branch, which, including the 270 square miles of the St. John area, comprises an area of 1,100 square miles, is completely forested and largely wild, has much undeveloped water power, and affords excellent opportunities for water storage.

The gaging station, which was established October 23, 1902, is located at the Bangor & Aroostook Railroad bridge, half a mile south of the railroad station at Grindstone, one-eighth mile above Grindstone Falls, and about 8 miles above the junction of the East Branch with the Penobscot at Medway. No water power is used on the river above the station, but dams are maintained at the outlets of several lakes and ponds near the source of the river, and the impounded water is used for log driving.

The datum of the chain gage has remained the same during the maintenance of the station.

Discharge measurements are made from the railroad bridge.

The discharge is affected by ice during the winter months, and in the log-driving season jams at the station and at Grindstone Falls immediately below are liable to materially vitiate the published results of discharge. When the flow is not affected by ice or by logs, conditions for obtaining accurate discharge data are good, except at low stages, when the current becomes very sluggish. A good discharge rating curve has been developed, although more measurements are required at extreme low and extreme high stages.

Data prior to 1910 have been compiled in Water-Supply Paper 279

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of East Branch of Penobscot River at Grindstone, Maine, in 1910

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 17 [a]	F. E. Pressey	252	1,320	5.26	462
June 8 [b]	do	274	2,660	8.90	4,710
20	W. E. Parsons	264	2,180	7.15	3,610
July 26	do	257	1,590	5.30	782

[a] Gage height to top of ice, 5.36 feet; ice 1.23 feet thick.

[b] Backwater caused by logs.

Daily gage height, in feet, of East Branch of Penobscot River at Grindstone, Maine, for 1910.

[George H. Goddard, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	.....	7.80	8.65	6.60	5.30	4.10	3.95	4.25	4.60
2	.....	5.90	6.10	.....	7.70	8.75	6.55	5.20	4.10	3.95	4.25	.....
3	.....	.....	.....	.....	7.65	9.05	6.45	5.28	4.10	3.95	4.20	.....
4	.....	.....	.....	.....	7.40	9.30	6.60	5.35	4.10	3.95	4.22	4.45
5	5.60	6.00	5.70	7.95	7.40	9.05	7.00	5.55	4.10	3.95	4.38	.....
6	.....	.....	.....	8.65	7.30	9.00	6.85	5.45	4.10	3.95	4.85	.....
7	.....	.....	.....	9.25	7.20	9.00	6.65	5.25	4.75	3.95	4.95	4.30
8	.....	.....	.....	9.20	7.15	8.95	6.40	5.15	4.98	3.90	4.80	.....
9	.....	5.80	5.50	9.00	7.10	8.75	6.70	5.08	4.68	3.90	4.68	.....
10	5.60	.....	.....	8.85	7.10	8.55	6.45	5.00	4.58	3.90	4.60	.....
11	.....	.....	.....	8.65	7.10	7.75	6.40	4.98	4.55	3.90	4.50	.....
12	.....	.....	5.40	8.20	6.90	7.30	6.25	4.90	4.38	3.88	4.50	.....
13	.....	5.70	.....	7.85	6.75	7.80	6.10	4.90	4.32	3.85	4.50	4.20
14	5.30	.....	.....	7.65	6.65	7.30	5.95	4.90	4.30	3.85	4.48	.....
15	.....	.....	.....	7.50	6.45	6.65	5.75	4.80	4.30	3.85	4.42	.....
16	.....	5.40	5.40	7.15	6.40	6.50	5.60	4.78	4.22	3.92	4.40	.....
17	5.30	.....	.....	6.85	6.80	7.00	5.55	4.68	4.20	4.02	4.40	.....
18	.....	.....	.....	6.80	7.35	7.30	5.50	4.62	4.15	4.18	4.35	.....
19	6.80	5.40	5.30	7.15	7.60	7.60	5.35	4.52	4.15	4.05	4.52	.....
20	.....	.....	.....	7.90	7.85	7.22	5.30	4.48	4.15	4.00	4.78	.....
21	.....	.....	.....	8.30	8.00	7.10	5.30	4.40	4.15	4.00	4.80	4.10
22	.....	.....	.....	8.30	6.30	7.20	5.20	4.32	4.15	4.00	4.78	.....
23	9.30	5.30	5.30	8.60	6.30	7.28	5.20	4.38	4.10	4.00	.....	.....
24	.....	.....	.....	8.80	6.30	7.35	5.20	4.32	4.10	4.00	.....	4.10
25	.....	.....	.....	8.80	6.55	7.30	5.20	4.28	4.10	4.00	4.70	.....
26	.....	.....	.....	8.80	7.40	7.00	5.30	4.20	4.08	4.18	.....	.....
27	7.10	5.40	.....	8.75	8.20	6.90	5.30	4.20	4.05	4.52	.....	5.10
28	.....	6.30	6.10	8.40	8.25	6.90	5.35	4.15	4.05	4.62	4.65	.....
29	.....	.....	.....	8.15	8.30	6.82	5.50	4.15	4.00	4.70	.....	5.10
30	.....	.....	6.60	7.90	8.60	6.72	5.50	4.10	3.98	4.58	.....	.....
31	.....	.....	.....	.....	8.70	.....	5.40	4.10	.....	4.38	.....	.....

NOTE.—Ice existed at this station from Jan. 1 to Apr. 4, and from about Nov. 21 to Dec. 31. Gage readings to water surface for Jan. 14, 17, 27, Feb. 2, 9, 16, 23, Mar. 2, 9, 16, and 23.

Gage heights to top of ice for Jan. 19, 23, Feb. 19, 27, 28, Mar. 5, 12, 19, Nov. 22, 25, 28, Dec. 1, 4, and 29.

It is not definitely known whether the remaining gage readings during the winter were to water surface or to top of ice.

The ice ranged in thickness from about 1.1 feet to 1.7 feet during January, February, and March, and attained a thickness of about 1.3 feet in December.

Daily discharge, in second-feet, of East Branch of Penobscot River at Grindstone, Maine, for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4,910	6,780	2,620	830	210	172	258	.....
2	.....	4,700	7,000	2,540	750	210	172	258	.....
3	.....	4,600	7,700	2,360	814	210	172	240	.....
4	.....	4,090	8,290	2,620	875	210	172	247	.....
5	5,220	4,090	7,700	3,320	1,080	210	172	307	.....
6	6,780	3,890	7,580	3,050	970	210	172	532	.....
7	8,170	3,700	7,580	2,700	790	480	172	590	.....
8	8,050	3,600	7,460	2,280	715	608	160	505	.....
9	7,580	3,510	7,000	2,790	668	445	160	445	.....
10	7,240	3,510	6,540	2,360	620	396	160	405	.....
11	6,780	3,510	4,800	2,280	608	382	160	360	.....
12	5,770	3,140	3,890	2,040	560	307	156	360	.....
13	5,020	2,880	4,910	1,810	560	283	150	360	.....
14	4,600	2,700	3,890	1,590	560	275	150	351	.....
15	4,290	2,360	2,700	1,320	505	275	150	324	.....
16	3,600	2,280	2,450	1,130	495	247	165	315	.....
17	3,050	2,960	3,320	1,070	445	240	190	315	.....
18	2,960	3,990	3,890	1,020	415	225	234	295	.....
19	3,600	4,490	4,490	875	369	225	198	369	.....
20	5,120	5,020	3,740	830	351	225	185	495	.....

Daily discharge, in second-feet, of East Branch of Penobscot River at Grindstone, Maine, for 1910—Continued.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	5,990	5,330	3,510	830	315	225	185	505	.....
22	5,990	2,120	3,700	750	283	225	185	495	.....
23	6,660	2,120	3,850	750	307	210	185	495	.....
24	7,120	2,120	3,990	750	283	210	185	455	.....
25	7,120	2,540	3,890	750	268	210	185	455	.....
26	7,120	4,090	3,320	830	240	205	234	455	.....
27	7,000	5,770	3,140	830	240	198	369	430	.....
28	6,210	5,880	3,140	875	225	198	415	430	.....
29	5,660	5,990	3,000	1,020	225	185	455	430	.....
30	5,120	6,660	2,820	1,020	210	180	396	405	.....
31	.....	6,890	.....	920	210	.....	307	.....	.....

NOTE.—Daily discharge determined from discharge rating curve fairly well defined between 400 and 10,000 second-feet. For November 21 to 30 the discharge has been assumed to be unaffected by the ice which existed during that period.

Monthly discharge of East Branch of Penobscot River at Grindstone, Maine, for 1910.

[Drainage area, 1,100 [a] square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	1,070	0.973	1.12	D.
February	.....	.....	591	.537	.56	D.
March	.....	.....	663	.603	.70	D.
April	8,170	.....	5,510	5.01	5.59	C.
May	6,890	2,120	3,980	3.62	4.17	B.
June	8,290	2,450	4,870	4.43	4.94	A.
July	3,320	750	1,610	1.46	1.68	A.
August	1,080	210	509	.463	.53	A.
September	608	180	264	.240	.27	C.
October	455	150	210	.191	.22	C.
November	595	240	396	.360	.40	B.
December	.....	.....	278	.253	.29	D.
The year	8,290	150	1,660	1.51	20.47	

[a] Includes Chamberlain Lake drainage of 270 square miles.

NOTE.—Discharge for the periods during which ice was present was estimated from the result of 1 discharge measurement made Jan. 17, with ice present, on climatological records and on the discharge from adjacent drainages. Mean discharge Apr. 1 to 4 estimated 3,380 second-feet.

This table supersedes table published in the first annual report of the Maine State Water Storage Commission.

MATTAWAMKEAG RIVER AT MATTAWAMKEAG, MAINE.

Mattawamkeag River rises near the eastern boundary of Maine and drains a country that is generally low and swampy, although there are on the river a few good power sites, none of which has been utilized. Dams are maintained at the outlets of several large lakes and ponds in this drainage basin, but the stored water is used merely for log driving. The total area of the basin is about 1,500 square miles.

The gaging station, which was established August 26, 1902, is located at the Maine Central Railroad bridge in the village of Mattawamkeag, about half a mile from the mouth of the river.

The datum of the chain gage has remained the same during the maintenance of the station.

Discharge measurements are made from the railroad bridge, which is slightly oblique to the thread of the stream. Low-water measurements are made by wading about 1 mile above the gage. The discharge is affected by ice during the winter, and also occasionally affected by log jams for short periods in the log-driving season. When the channel is unobstructed, conditions are good for obtaining accurate discharge data. A very good discharge rating curve has been developed.

Data prior to 1910 have been compiled in Water-Supply Paper 279.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of Mattawamkeag River at Mattawamkeag, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 23	F. E. Pressey	383	1,010	5.51	2,550
Aug. 12	W. E. Parsons [a]	162	228	3.92	530

[a] Made by wading about 1 mile above the gage.

Daily gage height, in feet, of Mattawamkeag River at Mattawamkeag, Maine, for 1910.

[W. T. Mincher, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				6.85	8.45	6.4	4.65	4.2	3.3	2.6	3.7	3.8
2	7.1			7.4	8.25	6.4	4.45	4.2	3.3	2.6	3.7	3.8
3				7.7	7.95	6.4	4.4	4.2	3.3	2.6	3.8	3.95
4				8.05	7.7	6.4	4.55	4.2	3.2	2.6	3.8	4.1
5				8.2	7.75	6.15	4.85	4.3	3.2	2.6	3.9	4.1
6		7.4	7.4	8.4	8.0	5.9	5.25	4.2	3.2	2.6	4.05	4.1
7				8.55	8.1	5.8	5.55	4.1	3.2	2.6	4.35	4.1
8				8.95	7.85	5.8	5.35	4.2	3.3	2.6	4.75	4.1
9	6.6			9.15	7.6	5.8	5.15	4.1	3.35	2.6	4.7	4.0
10				9.2	7.4	5.7	4.85	4.0	3.5	2.6	4.7	
11				9.05	7.2	5.7	4.7	4.0	3.5	2.6	4.55	
12		7.5		8.85	7.1	5.8	4.6	3.9	3.4	2.6	4.4	
13			7.6	8.65	7.0	5.85	4.5	3.8	3.4	2.6	4.35	
14				8.3	6.75	6.05	4.5	3.7	3.4	2.5	4.3	
15				7.9	6.55	6.2	4.5	3.7	3.4	2.5	4.2	
16	6.3			7.5	6.35	6.1	4.5	3.7	3.4	2.5	4.1	
17				6.95	6.15	6.0	4.4	3.7	3.5	2.5	4.0	
18				6.7	5.85	6.0	4.3	3.7	3.4	2.6	4.0	
19				6.65	5.8	6.1	4.3	3.6	3.2	2.6	4.0	
20		7.3	6.5	6.85	5.8	6.2	4.2	3.6	3.2	2.6	3.9	
21				7.75	5.7	6.4	4.1	3.5	3.2	2.6	3.8	
22				8.5	5.6	6.6	4.0	3.5	3.2	2.6	3.7	
23	7.9			8.95	5.6	6.45	4.0	3.4	3.1	2.6	3.7	
24				9.15	5.6	5.9	3.9	3.4	3.0	2.7	3.8	
25			6.0	9.35	5.7	5.45	3.8	3.5	3.0	2.7	3.8	
26			6.15	9.25	5.85	5.4	3.7	3.5	2.9	2.9	3.7	4.9
27		6.8	6.2	9.2	6.05	5.4	3.85	3.5	2.9	3.15	3.7	
28			6.2	9.1	6.2	5.3	4.1	3.4	2.9	3.3	3.6	
29			6.2	8.95	6.3	5.1	4.1	3.3	2.8	3.55	3.6	
30	8.5		6.35	8.7	6.4	4.8	4.2	3.3	2.7	3.6	3.6	
31			6.35		6.4		4.2	3.3		3.6		5.4

NOTE.—Ice prevailed at this station from Jan. 1 to Mar. 24 and from about Dec. 3 to 31. Gage heights were taken to water surface except Jan. 23 and 30, which were taken to top of ice. The thickness of ice from January to March varied from about 0.6 foot to about 1.7 feet

Daily discharge, in second-feet, of Mattawamkeag River at Mattawamkeag, Maine, for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4,780	8,300	3,900	1,200	818	295	100	470	525
2	.....	5,920	7,870	3,900	1,050	818	295	100	470	525
3	.....	6,580	7,100	3,900	1,000	818	295	100	525	.....
4	.....	7,390	6,580	3,900	1,100	818	258	100	525	.....
5	.....	7,750	6,700	3,430	1,500	906	258	100	590	.....
6	.....	8,230	7,270	2,980	2,020	818	258	100	698	.....
7	.....	8,600	7,510	2,820	2,430	736	258	100	953	.....
8	.....	9,620	6,920	2,820	2,150	818	295	100	1,380	.....
9	.....	10,100	6,300	2,820	1,880	736	314	100	1,320	.....
10	.....	10,300	5,920	2,660	1,500	660	375	100	1,320	.....
11	.....	9,880	5,490	2,660	1,320	660	375	100	1,100	.....
12	.....	9,360	5,280	2,820	1,210	590	334	100	1,000	.....
13	.....	8,860	5,080	2,900	1,100	525	334	100	953	.....
14	.....	7,990	4,580	3,250	1,100	470	334	86	906	.....
15	.....	7,040	4,180	3,520	1,100	470	334	86	818	.....
16	.....	6,140	3,800	3,340	1,100	470	334	86	736	.....
17	.....	4,980	3,430	3,160	1,000	470	375	86	660	.....
18	.....	4,480	2,900	3,160	906	470	334	100	660	.....
19	.....	4,380	2,820	3,340	906	420	258	100	600	.....
20	.....	4,780	2,820	3,520	818	420	258	100	590	.....
21	.....	6,700	2,660	3,900	736	375	258	100	525	.....
22	.....	8,480	2,500	4,280	660	375	258	100	470	.....
23	.....	9,620	2,500	4,000	660	334	223	100	470	.....
24	.....	10,100	2,500	2,980	590	334	190	114	525	.....
25	3,160	10,700	2,660	2,290	525	375	190	114	525	.....
26	3,430	10,400	2,900	2,220	470	375	160	160	470	.....
27	3,520	10,300	3,250	2,220	558	375	160	240	470	.....
28	3,520	10,000	3,520	2,080	736	334	160	295	420	.....
29	3,520	9,620	3,710	1,820	736	295	134	398	420	.....
30	3,800	8,980	3,900	1,440	818	295	114	420	420	.....
31	3,800	.....	3,900	.....	818	295	.....	420	.....	.....

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Monthly discharge of Mattawamkeag River at Mattawamkeag, Maine, for 1910.

[Drainage area, 1,500 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	1,800	1.20	1.38	D.
February	.....	.....	1,650	1.10	1.14	D.
March	3,800	.....	2,250	1.50	1.73	D.
April	10,700	4,380	8,070	5.38	6.00	B.
May	8,360	2,500	4,680	3.12	3.60	B.
June	4,280	1,440	3,070	2.05	2.29	A.
July	2,430	470	1,090	.727	.84	A.
August	906	295	538	.359	.41	A.
September	375	114	267	.178	.20	A.
October	420	86	142	.095	.11	A.
November	1,380	420	704	.469	.52	A.
December	.....	.....	648	.432	.50	D.
The year	10,700	86	2,070	1.38	18.72	

NOTE.—Discharge during the winter periods is based on climatologic records and the discharge from adjacent drainages. Mean discharge Mar. 1 to 24 estimated 1,880 second-feet.

This table supersedes table published in the first annual report of the Maine State Water Storage Commission.

PISCATAQUIS RIVER NEAR FOXCROFT, MAINE.

Piscataquis River rises in the hilly and mountainous region south and east of Moosehead Lake, flows for about 50 miles in an easterly direction, and enters the Penobscot at Howland. Its slopes and valleys are generally steep and the regimen of flow is therefore variable. Sebec, Schoodic, and Seboois streams, all outlets of large lakes having the same names, are the principal tributaries.

The gaging station, which was established August 17, 1902, is located at Low's bridge, about halfway between the villages of Guilford and Foxcroft. It is about three-fourths of a mile above the mouth of Black Stream and about 3 miles below Mill Stream. Water power is used at several manufacturing plants within a few miles above the station, and the river fluctuates considerably at the gage during low stages. There is little storage on the river above this point.

The staff gage datum has remained the same during the maintenance of the station.

Discharge measurements are made from the bridge or by wading.

During the winter the discharge is affected by ice.

Conditions for obtaining accurate discharge data are good and a good discharge rating curve has been developed for medium stages. At high and low stages the curve is not yet accurately defined.

Data prior to 1910 have been compiled in Water-Supply Paper 279.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of Piscataquis River near Foxcroft, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Feet.*	*Sec.-ft.*
Jan. 22[a]	F. E. Pressey	115	332	4.08	513
Apr. 12	do	128	367	4.27	1,440
May 7	do	128	393	4.03	1,250

[a] Affected by backwater.

Daily gage height, in feet, of Piscataquis River near Foxcroft, Maine, for 1910.

[A. F. D. Harlow, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.65	3.95	3.8	5.9	4.2	3.2	2.6	1.9	2.05	2.0	1.8	1.85
2	2.5	3.75	3.8	6.25	4.2	3.7	2.5	2.15	2.05	1.9	1.7	1.85
3	2.5	3.75	3.7	5.95	4.2	3.5	2.5	2.3	2.05	1.9	1.7	1.9
4	2.7	3.65	3.6	5.7	4.15	3.4	2.6	2.55	1.8	1.85	1.7	1.9
5	2.7	3.65	3.6	5.55	4.05	3.0	2.6	2.8	2.0	1.85	1.7	1.9
6	2.95	3.75	3.6	6.0	4.2	2.9	2.7	2.8	2.25	1.85	1.5	1.9
7	3.0	4.00	3.55	6.0	4.1	3.15	2.65	2.6	2.25	1.85	1.7	1.9
8	3.0	4.00	3.5	5.7	3.7	3.3	2.4	2.65	2.3	1.8	1.9	1.9
9	3.0	3.7	3.45	5.4	3.5	3.35	2.3	2.4	2.3	1.8	1.9	1.85
10	3.0	3.6	3.4	4.95	3.45	3.15	2.2	2.2	2.2	1.85	1.9	1.75

Daily gage height, in feet, of Piscataquis River near Foxcroft, Maine, for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	3.0	3.5	3.35	4.65	3.35	3.1	2.4	2.2	1.8	1.85	1.9	1.7
12	2.95	3.4	3.35	4.6	3.35	3.1	2.25	2.5	2.0	1.85	1.7	1.7
13	2.95	3.3	3.55	4.3	2.9	3.65	2.25	2.7	2.25	1.85	1.6	1.7
14	3.05	3.4	3.55	4.45	2.8	3.4	2.25	2.7	2.25	1.85	1.85	1.75
15	3.15	3.5	3.55	3.9	2.8	3.4	2.25	2.55	2.25	1.8	1.9	1.65
16	2.95	3.7	3.55	3.9	2.75	3.3	2.25	2.55	2.1	1.6	1.9	1.6
17	2.95	3.6	3.55	4.1	2.6	3.2	2.25	2.55	1.95	1.75	1.9	1.6
18	2.95	3.6	3.55	4.1	2.6	4.0	2.15	2.35	1.9	1.75	1.9	1.6
19	2.95	3.4	3.55	4.15	2.7	3.7	2.1	2.3	1.95	1.85	1.9	1.45
20	3.25	3.4	3.00	3.95	2.9	3.4	2.05	2.3	1.95	1.85	1.65	1.45
21	3.75	3.35	2.85	3.95	2.8	3.35	2.05	2.1	1.95	1.85	1.75	1.5
22	4.0	3.35	2.85	4.4	2.65	4.35	2.15	2.3	1.95	1.85	1.7	1.5
23	7.9	3.25	2.85	4.7	2.65	4.2	2.3	2.3	1.95	1.6	1.7	1.5
24	6.8	3.25	2.85	4.4	2.65	3.8	2.2	2.25	1.95	1.85	1.7	1.7
25	5.65	3.35	3.1	4.7	2.65	3.15	2.35	2.2	1.9	1.85	1.8	2.05
26	4.85	3.4	4.3	4.55	2.65	3.0	2.2	2.05	1.95	1.65	1.8	3.3
27	4.6	2.9	4.65	5.25	2.65	3.0	2.2	2.0	2.2	1.6	1.8	2.95
28	4.2	3.0	4.65	4.95	2.8	2.95	2.25	1.8	2.2	1.7	1.8	3.05
29	4.05	.....	4.9	4.65	2.6	2.9	2.15	2.05	2.2	1.7	1.8	3.0
30	3.9	.....	5.3	4.65	2.6	2.6	2.15	2.05	2.15	1.75	1.8	3.05
31	4.0	.....	5.3	.....	2.65	.....	2.15	2.05	.....	1.8	.....	3.05

NOTE.—Gage heights for the winter period taken to water surface. The river did not freeze over at the gage section, but was probably considerably affected by backwater from ice below the station from about Jan. 1 to about Mar. 20. The relation of gage height to discharge was probably little affected by ice during December.

Daily discharge, in second-feet, of Piscataquis River near Foxcroft, Maine, for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3,790	1,400	569	220	51	72	64	40	46
2	.....	4,430	1,400	938	180	90	72	51	31	46
3	.....	3,880	1,400	782	180	123	72	51	31	51
4	.....	3,440	1,350	709	220	200	46	46	31	51
5	.....	3,180	1,260	437	220	318	64	46	31	51
6	.....	3,970	1,400	374	267	318	112	46	19	51
7	.....	3,970	1,300	536	244	220	112	46	31	51
8	.....	3,440	938	638	148	244	123	40	51	51
9	.....	2,940	782	674	123	148	123	40	51	46
10	.....	2,280	745	536	100	100	100	46	51	36
11	.....	1,900	674	502	148	100	40	46	51	31
12	.....	1,840	674	502	112	180	64	46	31	31
13	.....	1,510	374	898	112	267	112	46	24	31
14	.....	1,670	318	709	112	267	112	46	46	36
15	.....	1,110	318	709	112	200	112	40	51	28
16	.....	1,110	293	638	112	200	81	24	51	24
17	.....	1,300	220	569	112	200	58	36	51	24
18	.....	1,300	220	1,210	90	136	51	36	51	24
19	.....	1,350	267	938	81	123	58	46	51	17
20	.....	1,160	374	709	72	123	58	46	28	17
21	346	1,160	318	674	72	81	58	46	36	19
22	346	1,620	244	1,560	90	123	58	46	31	19
23	346	1,960	244	1,400	123	123	58	24	31	19
24	346	1,620	244	1,020	100	112	58	46	31	31
25	502	1,960	244	536	136	100	51	46	40	72
26	1,510	1,780	244	437	100	72	58	28	40	638
27	1,900	2,710	244	437	100	64	100	24	40	406
28	1,900	2,280	318	406	112	40	100	31	40	470
29	2,220	1,900	220	374	90	72	100	31	40	437
30	2,780	1,900	220	220	90	72	90	36	40	470
31	2,780	.....	244	.....	90	72	.....	40	.....	470

NOTE.—Daily discharge determined from a discharge rating curve well defined between about 20 and 4,000 second-feet.

Monthly discharge of Piscataquis River near Foxcroft, Maine, for 1910.

[Drainage area, 286 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	300	1.05	1.21	D.
February	.....	.....	300	1.05	1.09	D.
March	2,780	.....	806	2.82	3.25	D.
April	4,430	1,110	2,280	7.97	8.89	A.
May	1,400	220	596	2.08	2.40	A.
June	1,560	220	688	2.41	2.69	A.
July	267	72	131	.458	.53	A.
August	318	40	146	.510	.59	A.
September	123	40	78.9	.276	.31	B.
October	64	24	41.5	.145	.17	C.
November	51	19	39.0	.136	.15	C.
December	638	17	122	.427	.49	B.
The year	4,430	17	459	1.60	21.77	

NOTE.—Discharges for period during which ice was present are based on the measurement made Jan. 22 with backwater existing, on climatological records, and on the discharge from adjacent drainages. Mean discharge, Mar. 1–20, estimated 500 second-feet.

This table supersedes table published in the first annual report of the Maine State Water Storage Commission.

COLD STREAM POND AT ENFIELD AND LINCOLN, MAINE.

Cold Stream Pond is located mostly in the towns of Enfield and Lincoln and is tributary to Passadumkeag Stream. It consists really of a series of connected ponds, the largest covering an area of about 8 square miles. A gaging station was maintained on the outlet of this pond from 1904 to 1906. The drainage area of Cold Stream at its mouth is about 37 square miles.

The following table shows the dates of closing and opening, or disappearance of ice from the pond, the record being compiled by Charles E. Darling, superintendent of the State fish hatchery, Enfield, Maine.

Dates of closing and opening of Cold Stream Pond, Maine.

Closed.	Opened.	Days closed.	Closed.	Opened.	Days closed.
	1900, Apr. 27	.....		1906, May 8	.....
	1901, Apr. 23	.....		1907, May 6	.....
	1902, Apr. 8	.....		1908, Apr. 28	.....
	1903, Apr. 7	.....		1909, May 3	.....
	1904, May 4	.....	1909, Dec. 21	1910, Apr. 6	107
	1905, Apr. 23	.....	1910, Dec. 12	1911, May 1	141

KENDUSKEAG STREAM NEAR BANGOR, MAINE.

This station, which was established September 15, 1908, is located at the wooden highway bridge about 6 miles northwest of the Bangor post office, and is just below Sixmile Falls, which affords the best unutilized power site of the lower stretch of the river.

The discharge at this point does not always represent the actual discharge from the original or natural drainage basin of Kenduskeag Stream. A number of years ago an artificial cut for use in log driving was made through a low divide between Souadabscook Stream and Black Stream, the latter a tributary of the Kenduskeag, entering it about 7 miles above the gaging station. During high stages in the Souadabscook a portion of its waters finds its way through the cut into Kenduskeag; at low stages in the Souadabscook all of the flow continues down its own channel. It is believed that all of the flow of Black Stream is into the Kenduskeag and none into the Souadabscook. The drainage area of Kenduskeag Stream above the mouth of Black Stream is 136 square miles; at the gaging station, including all of Black Stream but none of Souadabscook, it is 191 square miles; at the mouth, under the same conditions, it is 214 square miles. The drainage area of Black Stream itself is 40 square miles. The monthly discharge data show the conditions actually existing at the station. The estimates of discharge per square mile and depth in inches on the drainage area are not absolutely accurate on account of the conditions outlined above. There is no way of determining the actual area of the Souadabscook that contributes to the Kenduskeag discharge.

Gage heights are furnished by Fred Cort, of Bangor. The datum of the chain gage attached to the highway bridge has remained the same during the maintenance of the station. Discharge measurements are made from the highway bridge. During the winter months the relation between discharge and gage height is somewhat affected by ice. Conditions for obtaining accurate discharge data are good and a good discharge rating curve has been developed, although more measurements are needed at high stages.

Data prior to 1910 have been compiled in Water-Supply Paper 279.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of Kenduskeag Stream near Bangor, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 8[a]	F. E. Pressey	75	56	2.48	56
Mar. 26	do	99	398	5.05	1,200
June 4	do	92	94	2.24	93

[a] Present gage height to top of ice, 2.48 feet; thickness of ice, 0.76 foot.

Daily gage height, in feet, of Kenduskeag Stream near Bangor, Maine, for 1910.

[Fred Cort, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	4.3	3.95	4.8	4.35	2.4	2.1	1.7	1.5	1.5	1.6	1.8
2	2.4	4.3	4.25	4.85	4.15	2.3	2.0	1.75	1.5	1.5	1.6	1.75
3	.....	4.25	4.55	4.6	4.1	2.2	2.0	1.85	1.5	1.5	1.6	1.7
4	.....	4.05	4.65	4.2	4.15	2.15	2.0	1.9	1.5	1.5	1.6	1.7
5	.....	3.9	4.9	4.2	4.0	2.15	2.0	2.15	1.5	1.4	1.65	1.7
6	.....	3.65	5.0	4.1	3.7	2.3	2.0	2.2	1.5	1.4	1.7	1.7
7	.....	3.4	5.6	4.05	3.5	2.3	1.9	2.25	1.5	1.4	1.6	1.7
8	.....	3.4	6.55	3.9	3.3	2.3	1.85	2.3	1.55	1.4	1.5	1.7
9	1.9	3.1	6.25	3.75	3.35	2.2	1.9	2.2	1.6	1.4	1.5	1.6
10	.....	2.9	5.8	3.75	3.3	2.3	1.9	2.1	1.6	1.4	1.5	1.6
11	.....	2.95	5.25	3.55	2.85	2.4	1.8	2.0	1.6	1.4	1.5	1.6
12	.....	2.7	4.8	3.55	2.65	2.5	1.8	1.9	1.5	1.4	1.5	1.6
13	.....	3.05	4.55	3.4	2.55	2.4	1.7	1.8	1.5	1.4	1.5	1.6
14	.....	2.9	4.5	3.25	2.6	2.5	1.7	1.8	1.5	1.4	1.6	1.6
15	.....	3.05	4.6	3.15	2.6	2.4	1.8	1.75	1.5	1.4	1.6	1.6
16	1.9	3.2	4.5	2.9	2.35	2.4	1.8	1.7	1.5	1.4	1.6	1.6
17	.....	3.1	4.35	2.9	2.4	2.5	1.7	1.6	1.5	1.4	1.7	1.6
18	.....	3.2	3.85	2.9	2.3	2.4	1.7	1.6	1.5	1.4	1.7	1.6
19	2.2	3.1	3.55	3.05	2.1	2.5	1.7	1.6	1.5	1.4	1.7	1.7
20	3.05	3.2	3.5	3.25	2.1	2.5	1.7	1.7	1.5	1.4	1.65	1.7
21	3.4	3.3	3.6	3.5	2.1	2.45	1.7	1.7	1.5	1.4	1.6	1.7
22	3.65	3.3	4.0	4.0	2.2	2.4	1.7	1.7	1.5	1.4	1.7	1.7
23	6.2	3.4	4.15	4.15	2.25	2.5	1.7	1.6	1.4	1.4	1.6	1.7
24	6.9	3.5	4.5	4.05	2.15	2.5	1.7	1.6	1.4	1.4	1.6	1.8
25	6.4	3.4	4.8	4.05	2.0	2.6	1.65	1.55	1.4	1.4	1.6	2.45
26	5.75	3.5	5.1	4.05	2.15	2.5	1.7	1.6	1.4	1.45	1.7	2.9
27	5.55	3.4	5.15	4.4	2.45	2.4	1.7	1.6	1.4	1.6	1.7	3.25
28	5.35	3.55	4.8	4.6	2.9	2.3	1.65	1.6	1.4	1.65	1.8	3.6
29	4.9	.....	4.45	4.55	2.8	2.1	1.7	1.6	1.5	1.7	1.8	3.7
30	4.55	.....	4.6	4.7	2.7	2.1	1.7	1.6	1.5	1.6	1.8	3.7
31	4.5	.....	4.95	.....	2.45	.....	1.8	1.5	.....	1.6	.....	3.5

NOTE.—Gage heights affected by ice at this station from Jan. 1 to about Jan. 22. It is quite probable also that there was more or less backwater from ice during February, March, and December. All gage heights are probably to water surface. The thickness of ice during January was recorded as about 9 inches.

Daily discharge, in second-feet, of Kenduskeag Stream near Bangor, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	745	596	1,020	770	137	86	34	18	18	25	45
2	.....	745	722	1,040	678	119	71	40	18	18	25	40
3	.....	722	872	900	655	102	71	51	18	18	25	34
4	.....	635	928	700	678	94	71	57	18	18	25	34
5	.....	576	1,080	700	615	94	71	94	18	12	30	34
6	.....	483	1,140	655	501	119	71	102	18	12	34	34
7	.....	398	1,550	635	431	119	57	110	18	12	25	34
8	.....	398	2,290	576	366	119	51	119	22	12	18	34
9	.....	305	2,050	520	382	102	57	102	25	12	18	25
10	.....	249	1,700	520	366	119	57	86	25	12	18	25
11	.....	262	1,300	448	236	137	45	71	25	12	18	25
12	.....	199	1,015	448	188	156	45	57	18	12	18	25
13	.....	290	872	398	166	137	34	45	18	12	18	25
14	.....	249	845	350	177	156	34	45	18	12	25	25
15	.....	290	900	320	177	137	45	40	18	12	25	25
16	.....	335	845	249	128	137	45	34	18	12	25	25
17	.....	305	770	249	137	156	34	25	18	12	34	25
18	.....	335	557	249	119	137	34	25	18	12	34	25
19	.....	305	448	290	86	156	34	25	18	12	34	34
20	.....	335	431	350	86	156	34	34	18	12	30	34
21	.....	366	465	431	86	146	34	34	18	12	25	34
22	.....	366	615	615	102	137	34	34	18	12	34	34
23	2,010	398	678	678	110	156	34	25	12	12	25	34
24	2,590	431	845	635	94	156	34	25	12	12	25	45
25	2,170	398	1,020	635	71	177	30	22	12	12	25	146
26	1,660	431	1,200	635	94	156	34	25	12	15	34	249
27	1,520	398	1,240	795	146	137	34	25	12	25	34	350
28	1,380	448	1,020	900	249	119	30	25	12	30	45	465
29	1,080	.....	820	872	223	86	34	25	18	34	45	501
30	872	.....	900	955	199	86	34	25	18	25	45	501
31	845	.....	1,110	.....	146	.....	45	18	.....	25	.....	431

NOTE.—Daily discharge determined from a discharge rating curve well defined below about 1,800 second-feet. Open channel assumed Jan. 23 to Mar. 31 and during December.

Monthly discharge of Kenduskeag Stream near Bangor, Maine, for 1910.

[Drainage area 191 square miles.]

Month.	Discharge in second feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,590	56	538	2.82	3.25	D.
February	745	199	407	2.13	2.22	C.
March	2,290	431	994	5.20	6.00	C.
April	1,040	249	592	3.10	3.46	A.
May	770	71	273	1.43	1.65	A
June	177	86	132	.691	.77	A.
July	86	30	45.9	.240	.28	A.
August	119	18	47.7	.250	.29	A.
September	25	12	17.6	.092	.10	B.
October	34	12	15.4	.081	.09	B.
November	45	18	28.0	.147	.16	B.
December	501	25	113	.592	.68	B.
The year	2,590	12	266	1.39	18.95	

NOTE.—Mean discharge Jan. 1 to 22, estimated 116 second-feet, on the basis of one discharge measurement made Jan. 8, with ice present, and on climatological records.

This table supersedes table published in the first annual report of the Maine State Water Storage Commission.

KENNEBEC RIVER.

GENERAL FEATURES OF AREA DRAINED.[1]

Kennebec River rises in Moosehead Lake in the west-central part of Maine, the headwaters being collected by Moose River, Roach River, and a number of smaller streams rising in the hilly forested areas east and west of the lake, and drains an area extending from the Canada line to the ocean. This area measures about 150 miles in length, ranges in width from 50 to 80 miles in the main part, and embraces a total area of 5,970 square miles—about one-fifth the total area of the State—of which 1,240 square miles are tributary to Moosehead Lake. The length of the river from Moosehead Lake to its entrance into Merrymeeting Bay, near Brunswick, including the more considerable windings, is about 140 miles.

The surface of the headwater region is broken by offsets from the White Mountains. Near Moosehead Lake most of the hills and highlands lie well back from the lake. Below the lake nearly to The Forks the river is a torrent, flowing in a narrow, rocky chasm with precipitous sides. Below the junction of Dead River at The Forks the Kennebec flows through a broader valley with gentler slopes. The general elevation of the basin is less than that of the Androscoggin, which adjoins it on the west, although near the center of the area Saddleback, Abraham, and Bigelow mountains rise as isolated peaks to an elevation higher than any mountains in the State except Katahdin.

[1] All available data pertaining to the Kennebec River drainage basin prior to 1907 have been published in Water-Supply Paper 198, "Water resources of the Kennebec River basin."

The extreme headwaters of the Kennebec at the Canadian line reach an elevation of approximately 2,000 feet above sea level. Moosehead Lake is about 1,026 feet above tidewater and distant from it 120 miles; the average descent of the river below the lake is therefore 8.55 feet per mile.

The area drained by the Kennebec presents considerable variety in its rock formations. In the northern part of the basin the rocks include sandstones, conglomerates, shales, slates, impure limestones, and some masses of volcanic rocks of which the rhyolite of Mount Kineo furnishes the most conspicuous exposure. In the central and southern portions of the basin extensive areas of granite appear. The quarries at Hallowell are located on one of the larger masses of pure granite. A notable characteristic of the rocks in the Kennebec basin is their compactness and hardness, which gives permanence to the present channels of the river. The surface materials are usually finely pulverized, and water-retaining sands and gravels, more abundant in the northern part of the area, are succeeded southward by a larger proportion of loam and clay.

The greater part of the Kennebec River basin is forested and the upper area is heavily timbered, although extensive cutting has been going on for many years. Spruce is most abundant, and large quantities of poplar, valuable in the production of the best grades of paper, are found. About one-third of all the lumber used in the State for pulp and paper comes from the Kennebec basin.

The mean annual precipitation in the Kennebec basin above Waterville is about 40 inches. It ranges from a little over 44 inches at Gardiner to probably not over 35 inches in the extreme northwestern part of the basin.

The river is generally frozen over during the winter, and the snow in the northern portions of the basin frequently accumulates to a depth of 3 feet (equivalent to 5 or 6 inches of water).

The basin affords excellent natural storage facilities. About 299 square miles of the area is lake and pond surface. Moosehead Lake, 115 square miles in area, is the largest lake in New England. It is about 35 miles in extreme length, 12 miles in maximum width, and of such depth that it is crossed by steamboats from end to end. It has been in use many years as a reservoir to store the spring flow for use in log driving and for power and is controlled by substantial log-crib dams at its two outlets. The east outlet stream is the more important and is joined by the west outlet stream at the upper end of Indian Pond, about 4 miles below the lake.

The present head of water at Moosehead Lake is about 7.5 feet, corresponding to about 23.5 billion cubic feet storage, but surveys and estimates made by the Kennebec Water Power Co. cover an additional depth of 2 feet, corresponding to approximately 1.6 square miles of

additional water area. Property at Greenville and Kineo would be considerably damaged by this change, but an additional storage capacity of about 6.5 billion cubic feet would result. The lake could also be drawn down to a lower level by dredging at the outlet, which, however, would doubtless be objected to by the companies interested in navigation.

Other important but little used storage basins on Kennebec headwaters are Brassua Lake and Long, Wood, Attean, and Roach ponds. Economical storage in the headwaters up to 40 billion cubic feet capacity is possible, which, with that on Dead River and other tributaries should make the Kennebec River, with its large amount of of fall, one of the best power streams in the country.

Though the regimen of flow of the Kennebec has been much improved by storage in Moosehead Lake, systematic regulation of the use of stored water is greatly needed, for much of the stored water impounded by the lake at the present time is needlessly wasted during log driving and at other times for lack of an adequate system of measuring and recording the flow from the outlets.

The Kennebec has always been an important river for log driving, the annual drive at present amounting to about 150 million feet b. m.

Below Skowhegan practically all of the fall is utilized for power development, but above that point there is a large amount of unutilized fall. About 40 feet of fall in the vicinity of Madison has lately been developed by the Hollingsworth & Whitney Co. for a pulp and paper mill. Some of the important industries using water power on the main river are the cotton mills at Augusta and Waterville, the pulp and paper mills at Waterville, Skowhegan, Madison, and Solon, and numerous lumber mills.

The longest continuous run-off record on the main river is that at Waterville, beginning in 1893. The driest year since that time was 1908, and the wettest year 1907, the total flow in these two years being in the ratio of about 1 to 2.32.

RIVER SURVEYS IN KENNEBEC RIVER BASIN.

The results of river and lake surveys made in the Kennebec River basin by the United States Geological Survey in cooperation with the State of Maine are represented by the maps of the following list:

	Sheets.
Kennebec River, Skowhegan to The Forks	4
Kennebec River, The Forks to Moosehead Lake	1
Kennebec River, Profile, Tidewater to Moosehead Lake	1
Brassua Lake, Brassua Lake Outlet	1
Wood Pond, Wood Pond Outlet	1
Attean Pond	1
Holeb Pond, Long Pond, Moose River, Moosehead Lake to Brassua Lake	1

	Sheets.
Spring Lake, West Carry Lake, Spencer Ponds, Middle Roach Pond, Lower Roach Pond	1
Dead River	9
Sandy River	5

The river maps show not only the plan of the river, with 5-foot contours along the banks, but also the profiles, and are valuable in studying developed and undeveloped water-power sites, as, in connection with the stream-gaging records, they afford data for a close estimate of the total horsepower that can be developed at the falls and rips. The special lake maps are of value in computing the capacity of the lakes in cubic feet if their use as storage reservoirs is contemplated.

These maps may be had without charge by applying to C. C. Babb, district engineer, United States Geological Survey, State House, Augusta, Maine.

MOOSE RIVER NEAR ROCKWOOD, MAINE.

This station, which was established September 7, 1902, discontinued December 31, 1908, and reestablished May 16, 1910, is located about 2 miles from Rockwood, at a deserted cabin one-fourth mile above the farmhouse of Edilbert Arsenault, 2 miles above the mouth of the river and 4 miles west of Kineo, from which it may be reached by steamer or rowboat.

A standard chain gage is attached to trees on the right bank about 100 feet above the cable. Its datum is 1,023.46 feet above mean sea level and has remained unchanged, but a temporary staff gage was used from May 16 to 30, 1910, and also during low and winter periods in earlier years.

At high stages discharge measurements are made from a car suspended from a steel cable. Low-stage measurements are made by wading a short distance downstream from the cable.

Dams are maintained at the outlets of several lakes and ponds above the station, but all such stored water is used for log driving and the effect upon the regimen of flow is but temporary

Discharge during the winter months is affected by ice. Conditions for obtaining accurate discharge data are good, and a good rating curve has been developed except for extreme low stages, where it is somewhat uncertain. The 1908 rating curve has been used in computing the discharge for 1910, except as noted under the tables below.

Data prior to 1907 have been compiled inWater-Supply Paper 198.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of Moose River near Rockwood, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 16[a]	F. E. Pressey	245	1,150	4.94	2,390
30[a]	do	235	1,020	4.98	2,400
June 27[a]	W. E. Parsons	245	995	4.32	1,820
Aug. 3	do	140	169	2.13	266
3	do	140	168	2.10	264

[a] The measurements of May 16, May 30, and June 27 plot uniformly about 360 second-feet in excess of the regular open channel discharge rating curve, due to some unknown cause. Log jams existed at the time these measurements were made.

Daily gage height, in feet, of Moose River, near Rockwood, Maine, for 1910.

[Edilbert Arsenault, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.95	4.55	2.1	1.8	2.0	2.3	2.5
2	.....	5.55	4.65	2.1	1.75	2.1	2.2	2.5
3	.....	5.95	4.7	2.15	1.7	2.1	2.2	2.5
4	.....	6.2	4.75	2.2	1.7	2.1	2.3	2.6
5	.....	5.75	4.55	2.3	1.65	2.1	2.4	2.6
6	.....	6.0	3.9	2.2	1.75	2.1	2.4	2.6
7	.....	5.95	3.65	2.2	1.9	2.1	2.4	2.6
8	.....	4.95	3.65	2.3	2.0	2.0	2.4	2.6
9	.....	4.95	3.7	2.2	2.0	2.0	2.4	2.6
10	.....	5.0	3.55	2.2	2.05	2.0	2.4	2.6
11	.....	4.85	3.5	2.2	2.05	2.0	2.5	2.6
12	.....	4.65	3.3	2.2	2.05	2.0	2.5	2.6
13	.....	4.7	3.2	2.2	2.2	2.0	2.5	2.6
14	.....	4.7	3.2	2.2	2.2	1.9	2.6	2.5
15	.....	4.7	3.05	2.2	2.2	1.9	2.7	2.5
16	4.9	4.55	2.95	2.2	2.2	1.9	2.8	2.5
17	4.65	4.45	2.9	2.2	2.1	1.9	2.8	2.5
18	4.35	4.55	2.75	2.2	2.1	1.8	2.8	2.5
19	4.35	4.4	2.7	2.1	2.1	1.8	2.8	2.9
20	4.25	4.35	2.6	2.1	2.1	1.8	2.5	2.7
21	4.25	4.4	2.6	2.1	2.1	1.9	2.3	2.6
22	4.2	4.5	2.6	2.1	2.1	1.9	2.9	2.4
23	4.25	4.5	2.6	2.0	2.0	1.9	2.8	2.3
24	4.25	4.6	2.55	2.0	2.0	1.9	2.7	2.45
25	4.25	4.4	2.45	2.0	2.0	1.9	2.7	2.45
26	4.25	4.35	2.4	2.0	2.0	2.0	2.7	2.7
27	4.4	4.35	2.4	2.0	2.0	2.0	2.7	2.55
28	4.65	4.3	2.35	2.0	2.0	2.0	2.6	2.4
29	4.7	4.25	2.25	2.0	2.0	2.1	2.5	2.55
30	4.9	4.5	2.2	1.95	2.0	2.2	2.5	2.6
31	5.0	.....	2.2	1.8	.....	2.3	.....	2.7

NOTE.—A temporary gage was used May 16 to 30. The gage heights for this period have been reduced to the original gage datum.

The gage heights were more or less affected by log jams from May to July. See, also, footnote to daily discharges.

Backwater caused by ice prevailed during December. Gage readings during December were probably to water surface.

Daily discharge, in second-feet, of Moose River near Rockwood, Maine, for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2,380	2,020	270	177	238	338
2	.....	2,900	2,100	270	162	270	303
3	.....	3,310	2,150	286	148	270	303
4	.....	3,560	2,200	303	148	270	338
5	.....	3,120	2,020	338	134	270	375
6	.....	3,360	1 340	303	162	270	375
7	.....	3,310	1,110	303	207	270	375
8	.....	2,380	1,110	338	238	238	375
9	.....	2,380	1,180	303	238	238	375
10	.....	2,420	937	303	254	238	375
11	.....	2,280	906	303	254	238	414
12	.....	2,100	788	303	254	238	414
13	.....	2,150	733	303	303	238	414
14	.....	2,150	733	303	303	207	454
15	.....	2,150	656	303	303	207	496
16	2,330	2,020	608	303	303	207	539
17	2,100	1,930	584	303	270	207	539
18	1,850	2,020	518	303	270	177	539
19	1,850	1,890	496	270	270	177	539
20	1,770	1,850	454	270	270	177	414
21	1,770	1,890	454	270	270	207	338
22	1,730	1,980	454	270	270	207	584
23	1,770	1,980	454	238	238	207	539
24	1,770	2,000	434	238	238	207	496
25	1,770	1,890	394	238	238	207	496
26	1,770	1,850	375	238	238	238	496
27	1,890	1,850	375	238	238	238	496
28	2,100	1,810	356	238	238	238	454
29	2,150	1,770	320	238	238	270	414
30	2,330	1,980	303	222	238	303	414
31	2,420	.....	303	177	.....	338	.....

NOTE.—Measurements made May 16, May 30, and June 27 indicate abnormal conditions. An auxiliary discharge rating curve about 360 second-feet in excess of the regular free-flow rating curve was passed through these measurements and used until July 5. From July 6 to 10 a transition curve was used merging with the free-flow curve at gage height 3.5 feet. From July 11 to Nov. 30 the daily discharge is obtained from the rating curve used during 1907–8 and well defined except below 150 second-feet.

Monthly discharge of Moose River near Rockwood, Maine, for 1910.

[Drainage area, 680 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
May 16–31	2,420	1,730	1,960	2.88	1.71	B.
June	3,560	1,770	2,290	3.37	3.76	B.
July	2,200	303	867	1.28	1.48	B.
August	338	177	277	.407	.47	A.
September	303	134	237	.349	.39	A.
October	338	177	236	.347	.40	A.
November	584	303	434	.638	.71	A.
December	.....	.....	200	.294	.34	D.

NOTE.—The discharge for December, which was affected by ice, was estimated from climatological records, studies of the effect of storage at Moosehead Lake, and consideration of conditions of run-off at other stations in the Kennebec River drainage.

This table supersedes table published in the first annual report of the Maine State Water Storage Commission.

MOOSEHEAD LAKE AT EAST OUTLET, MAINE.

The record of gage heights of Moosehead Lake level has been kept since April, 1895, by the Hollingsworth & Whitney Co. This record, supplemented by gage readings at Greenville for a part of the time, has been furnished for publication by the company.

The drainage area at the east outlet comprises 1,240 square miles.

A staff gage is attached at end of boat landing wharf on east outlet of lake, about 8 miles from Kineo. The zero of the gage is at the sill of the outlet gates.

Two gage datums have been used at the east outlet; the first or original datum is at elevation 1,011.30 feet above mean sea level, and approximately 10 feet below gate sills; the other is 10 feet higher, that is, zero at the sill of the gates, all gage readings referred to this latter datum. There are 35 gates in the dam, 15 old gates with sills at gage height (original datum) 10 feet; and 20 new gates, with sills at gage height (original datum) 8 feet. There is a bar above the dam at approximate gage height (original datum) of 9 feet and this bar and not the gates controls the flow at extreme low water.

Gage readings prior to 1907 have been compiled in Water-Supply Paper 198.

The following table gives the available dates of opening and closing of Moosehead Lake due to ice:

Dates of opening and closing of Moosehead Lake.

Closed.	Opened.	Days closed.	Closed.	Opened.	Days closed.
	1881, May 9			1897, May 10	
	1882, May 19			1898, May 3	
	1883, May 13			1899, May 6	
	1884, May 16			1900, May 14	
	1885, May 16			1901, May 1	
	1886, May 2			1902, Apr. 29	
	1887, May 12			1903, Apr. 28	
	1888, May 21			1904, May 10	
	1889, Apr. 29			1905, May 3	
	1890, May 8			1906, May 13	
	1891, May 14		1906, Dec. 2	1907, May 14	164
	1892, May 4		1907, Dec. 2	1908, May 11	162
	1893, May 19		1908, Dec. 5	1909, May 13	160
	1894, Apr. 29		1909, Dec. 11	1910, Apr. 20	131
	1896, May 9				

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily gage height, in feet, of Moosehead Lake at East Outlet, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			3.65	4.00		7.60	7.50	6.05				
2					7.45				4.65		2.45	1.85
3	4.25					7.60				3.75		
4		3.75	3.65	4.40	7.55		7.55	6.00			2.35	1.75
5	4.25							5.90	4.60	3.65		
6				4.70	7.55	7.60	7.55					
7		3.85	3.65						4.60	3.60	2.40	1.70
8	4.10			5.20		7.55	7.55	5.80				
9		3.80	3.65						4.55			1.70
10	3.95					7.60		5.60		3.50	2.30	1.55
11		3.80	3.65	5.75	7.65		7.40				2.30	
12	3.90							5.60	4.50	3.40		
13				6.10	7.50	7.55	7.20					
14	3.85	3.80	3.65						4.45	3.20	2.20	1.55
15				6.35		7.55	7.05	5.45				
16		3.80	3.55		7.45				4.35		2.10	1.35
17	3.75					7.55		5.35		3.10		
18		3.80	3.50	6.65	7.45		6.95				2.05	
19	3.80							5.25	4.15	3.00		1.40
20				6.80	7.40	7.55	6.85					
21	3.75	3.80	3.50						4.15	2.90	2.05	1.40
22				7.05		7.80	6.70	5.15				
23		3.75	3.70		7.30				4.10		2.00	1.35
24	3.75				7.40	7.65		5.00		2.80		
25		3.75	3.70	7.30			6.75	4.80			2.00	
26	3.75								4.00	2.70		1.30
27				7.40	7.55	7.60	6.40					
28	3.75	3.65	3.70						3.95	2.65	1.95	1.30
29				7.40		7.60	6.30	4.80				
30			3.80		7.55				3.80		1.95	1.30
31	3.80							4.70		2.55		

KENNEBEC RIVER AT THE FORKS, MAINE.

This station, which was established September 28, 1901, is located at the wooden highway bridge across the Kennebec at The Forks, about 2,000 feet above the mouth of Dead River.

The nearest dam used for storage is about 12 miles above the station, at the outlet of Indian Pond. From about May 1 to July 31 fluctuations in gage height ranging from 2 to over 5 feet, are caused each day for regulation of flow for log driving.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station. Its elevation above mean sea level, revised July, 1906, is 565.44 feet.

Discharge measurements are made from the bridge.

During the winter months the discharge is affected by ice.

Conditions for obtaining accurate discharge data during conditions of free flow are fairly good and a good discharge rating curve has been developed. High water in Dead River occurring at a time of low water in Kennebec River is liable to cause backwater at the station on the latter river.

Data prior to 1907 have been revised and compiled in Water-Supply Paper 198.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of Kennebec River at The Forks, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 17	F. E. Pressey	118	653	1.76	[a]970
May 17	do	133	913	3.68	3,410
June 28	W. E. Parsons	120	559	0.96	556
Aug. 17	do	127	737	2.60	1,980

[a] Meter affected by anchor ice.

Daily gage height, in feet, of Kennebec River at The Forks, Maine, for 1910.

[Wm. W. Young, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.3	8.4	.....	3.1	.....	5.7	.....	.....	2.1	2.3	2.2	1.9
2	3.3	.....	.....	3.4	.....	5.45	.....	.....	2.1	2.3	2.15	1.9
3	3.3	.....	.....	3.8	.....	5.55	.....	.....	2.1	2.3	2.0	1.9
4	3.55	7.9	.....	3.0	.....	5.65	.....	.....	2.05	2.3	2.0	1.9
5	3.7	7.4	.....	2.6	.....	.....	.....	.....	2.0	2.3	2.0	1.9
6	3.55	.....	2.05	2.9	.....	.....	.....	4.85	2.0	2.3	2.0	1.9
7	3.3	7.4	2.15	3.5	.....	.....	.....	4.5	1.95	2.3	2.0	1.9
8	3.25	.....	2.1	4.35	.....	.....	.....	4.25	1.9	2.3	2.0	1.8
9	3.7	8.0	2.0	4.05	.....	.....	.....	3.85	1.85	2.3	1.95	1.8
10	3.7	.....	1.9	3.1	.....	.....	.....	3.35	1.8	2.3	1.9	1.8
11	3.7	8.7	1.9	2.65	.....	.....	.....	2.95	1.85	2.3	1.9	1.9
12	3.8	8.8	1.9	2.45	.....	.....	.....	2.9	1.95	2.15	1.9	1.9
13	4.0	.....	1.9	2.3	.....	.....	.....	2.85	2.1	2.1	1.9	1.9
14	4.0	.....	1.9	2.15	.....	.....	.....	2.9	2.1	2.1	1.8	2.0
15	4.0	.....	1.9	2.0	.....	.....	.....	2.9	2.1	2.1	1.8	2.0
16	4.0	.....	1.85	2.2	.....	.....	.....	2.75	2.1	2.1	1.75	2.2
17	3.4	.....	1.7	2.6	.....	.....	.....	2.6	2.1	2.2	1.7	2.3
18	3.3	.....	1.65	2.8	.....	.....	.....	2.55	2.1	2.2	1.7	2.35
19	3.2	.....	1.7	2.8	.....	.....	.....	2.6	2.1	2.2	1.7	2.35
20	3.2	.....	1.7	2.95	.....	.....	.....	2.5	2.1	2.2	1.5	2.25
21	3.15	.....	1.7	5.0	.....	.....	.....	2.5	2.1	2.2	1.5	2.3
22	2.95	.....	1.8	5.25	.....	.....	.....	2.45	2.1	2.2	1.6	2.3
23	5.6	.....	2.15	5.1	.....	5.65	.....	2.4	2.1	2.2	1.75	2.3
24	8.0	.....	2.55	5.5	.....	5.45	.....	2.4	2.1	2.3	1.8	2.35
25	6.9	.....	2.7	6.0	.....	5.25	.....	2.3	2.1	2.3	1.8	2.5
26	5.3	.....	3.05	5.75	.....	.....	.....	2.3	2.2	2.4	1.8	2.5
27	5.0	.....	3.0	5.95	.....	.....	.....	2.3	2.2	2.5	1.8	2.5
28	6.0	.....	2.65	6.5	.....	.....	.....	2.3	2.2	2.6	1.8	2.4
29	6.0	.....	2.5	6.05	5.15	.....	.....	2.2	2.3	2.35	1.8	2.3
30	6.3	.....	2.65	5.75	5.5	.....	.....	2.2	2.3	2.2	1.8	2.2
31	8.4	.....	2.75	.....	5.55	.....	.....	2.2	.....	2.2	.....	2.2

NOTE.—The daily gage heights were probably affected by ice from Jan. 1 to Mar. 5 and from Dec. 16 to 31. There was an ice jam at this station from Jan. 23 to Mar. 5. Gage heights are to water surface except for the period Jan. 23 to Feb. 12, which is doubtful.

The daily gage heights for May 1–28, June 5 to 22, and June 26 to Aug. 5 are omitted, since they are not true indexes of the daily discharge owing to great daily fluctuation of stage caused by logging operations.

Daily discharge, in second-feet, of Kennebec River at The Forks, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	2,600	7,530	7,320	2,990	2,840	1,430	1,630	1,530	1,240
2	.....	.....	.....	3,020	8,040	6,800	2,960	3,010	1,430	1,630	1,480	1,240
3	.....	.....	.....	3,640	7,470	7,000	2,880	3,120	1,430	1,630	1,330	1,240
4	.....	.....	.....	2,460	6,920	7,220	3,080	2,750	1,380	1,630	1,330	1,240
5	.....	.....	.....	1,960	6,920	4,690	2,960	2,680	1,330	1,630	1,330	1,240
6	.....	.....	1,380	2,330	7,250	4,220	4,310	5,560	1,330	1,630	1,330	1,240
7	.....	.....	1,480	3,170	6,650	5,680	4,320	4,880	1,280	1,630	1,330	1,240
8	.....	.....	1,430	4,600	6,650	5,520	4,310	4,420	1,240	1,630	1,330	1,160
9	.....	.....	1,330	4,060	7,250	4,030	3,160	3,730	1,200	1,630	1,280	1,160
10	.....	.....	1,240	2,600	7,360	3,960	4,360	2,950	1,160	1,630	1,240	1,160
11	.....	.....	1,240	2,020	9,810	4,110	4,390	2,400	1,200	1,630	1,240	1,240
12	.....	.....	1,240	1,800	9,260	4,270	3,150	2,330	1,280	1,480	1,240	1,240
13	.....	.....	1,240	1,630	6,810	3,770	3,120	2,270	1,430	1,430	1,240	1,240
14	.....	.....	1,240	1,480	4,580	3,590	3,040	2,330	1,430	1,430	1,160	1,330
15	.....	.....	1,240	1,330	4,760	3,820	3,040	2,330	1,430	1,430	1,160	1,330
16	.....	.....	1,200	1,530	5,640	3,830	3,150	2,140	1,430	1,430	1,120	.....
17	.....	.....	1,080	1,960	5,210	3,970	3,080	1,960	1,430	1,530	1,080	.....
18	.....	.....	1,040	2,200	6,600	3,760	3,160	1,910	1,430	1,530	1,080	.....
19	.....	.....	1,080	2,200	4,070	3,750	2,980	1,960	1,430	1,530	1,080	.....
20	.....	.....	1,080	2,400	4,000	3,680	2,980	1,850	1,430	1,530	920	.....
21	.....	.....	1,080	5,870	2,560	3,590	3,050	1,850	1,430	1,530	920	.....
22	.....	.....	1,160	6,380	2,500	6,660	3,080	1,800	1,430	1,530	995	.....
23	.....	.....	1,480	6,080	2,410	7,220	2,980	1,740	1,430	1,530	1,120	.....
24	.....	.....	1,910	6,900	2,290	6,800	2,980	1,740	1,430	1,630	1,160	.....
25	.....	.....	2,080	7,970	3,970	6,380	2,980	1,630	1,430	1,630	1,160	.....
26	.....	.....	2,530	7,430	6,070	3,860	2,840	1,630	1,530	1,740	1,160	.....
27	.....	.....	2,460	7,860	6,710	3,900	2,840	1,630	1,530	1,850	1,160	.....
28	.....	.....	2,020	9,070	5,890	3,120	2,840	1,630	1,530	1,960	1,160	.....
29	.....	.....	1,850	8,080	6,180	3,080	2,840	1,530	1,630	1,680	1,160	.....
30	.....	.....	2,020	7,430	6,900	3,050	2,890	1,530	1,630	1,530	1,160	.....
31	.....	.....	2,140	.....	7,000	.....	2,890	1,530	.....	1,530	.....	.....

NOTE.—Daily discharges determined from a well-defined discharge rating curve. Values for about Apr. 21 to about Aug. 5 may be much in error, however, due to errors in computed discharge caused by controlled flow for flushing logs down the river and backwater from log jams.

From May 1–28, June 5–22, and June 26 to Aug. 5 the daily discharge was computed by applying the discharge rating table to the several gage readings taken during any given day and weighing these values in accordance with the proportional part of the day to which each gage height is applicable.

Monthly discharge of Kennebec River at The Forks, Maine, for 1910.

[Drainage area, 1,570 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	2,000	1.27	1.46	D.
February	.....	.....	1,750	1.11	1.16	D.
March	2,530	1,040	1,510	.962	1.11	C.
April	9,070	1,330	4,070	2.59	2.89	C.
May	9,810	2,290	5,980	3.81	4.39	B.
June	7,320	3,050	4,760	3.03	3.38	B.
July	4,390	2,840	3,210	2.04	2.35	B.
August	5,560	1,530	2,440	1.55	1.79	B.
September	1,630	1,160	1,400	.892	1.00	A.
October	1,960	1,430	1,590	1.01	1.16	A.
November	1,530	920	1,200	.764	.85	A.
December	.....	.....	1,250	.796	.92	C.
The year	9,810	.....	2,610	1.66	22.46	

NOTE.—The discharge during the winter periods is estimated from a study of climatological records, storage records, and records of discharge at other stations in the Kennebec drainage.

Mean discharge Mar. 1–5 estimated 1,500 second-feet; Dec. 16–31, estimated 1,270 second-feet.

This table supersedes table published in the first annual report of the Maine State Water Storage Commission.

KENNEBEC RIVER AT BINGHAM, MAINE.

This station, which is located at the new steel highway bridge across Kennebec River at Bingham, just below the mouth of Austin Stream, was established June 21, 1907. It was discontinued June 30, 1910, because of the reestablishment of the station on Dead River at The Forks. The two stations at The Forks, combined, give very nearly the discharge at Bingham. The nearest dam is about 11 miles downstream, at Solon, but the station is above the influence of backwater, although in the near future it is expected that it will be flooded out by the increase in height of the Solon dam.

The datum of the chain gage attached to the highway bridge has remained the same during the maintenance of the station. Discharge measurements are made from the bridge.

During the winter months the relation of gage height to discharge is much affected by ice, and during the spring and summer months there is also backwater from log jams.

Conditions for obtaining accurate discharge data are good and a well-defined discharge rating curve has been developed for free flow conditions.

This station was established to replace the stations at North Anson on the Kennebec, and The Forks on Dead River. In connection with the other stations in this drainage basin the records of discharge will afford a basis for an estimate of water for power and storage flowing in the Kennebec at any point.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of Kennebec River at Bingham, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.		Discharge.
				To top of ice.	To water surface.	
		Feet	*Sq. ft.*	*Feet.*	*Feet.*	*Sec.-ft.*
Jan. 28[a]	F. E. Pressey	439	2,650	7.22	6.89	3,920
Mar. 15[b]	do	421	1,980	6.43	5.84	1,700
May 18	do	440	2,640	.....	4.95	8,400

[a] Thickness of ice, 1.97 feet.
[b] Average thickness of ice, 2.32 feet; average distance from water surface to top of ice, .59 foot.

Daily gage height, in feet, and discharge, in second-feet, of Kennebec River at Bingham, Maine, for 1910.

[C. R. Ellis, observer.]

Day.	Jan.		Feb.		Mar.		Apr.		May.		June.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	7.9						8.3	14,000	5.6	11,000	6.0	12,900
2							6.2	13,900	5.9	12,400	5.75	11,700
3							5.2	9,210	5.35	9,860	5.8	11,900
4	7.5		6.1				5.0	8,380	5.4	10,100	5.75	11,700
5					7.0		4.7	7,230	5.6	11,000	4.95	8,180
6							5.6	11,000	6.05	13,100	5.45	10,300
7							7.0	18,100	5.5	10,500	5.35	9,860
8							5.8	11,900	5.75	11,700	4.6	6,860
9	7.1						6.5	15,400	5.65	11,200	4.3	5,810
10							6.1	13,400	5.7	11,400	4.5	6,500
11			6.1				5.3	9,640	6.2	13,900	4.75	7,420
12	7.2						5.0	8,380	5.85	12,200	4.5	6,500
13							4.5	6,500	5.7	11,400	4.6	6,860
14							4.6	6,860	5.3	9,640	4.3	5,810
15					5.6		4.1	5,160	4.95	8,180	4.45	6,320
16	7.5						3.9	4,550	5.1	8,790	4.35	5,980
17							3.9	4,550	5.45	10,300	4.1	5,160
18			6.5				4.1	5,160	5.45	10,300	3.95	4,700
19	7.4						4.2	5,480	5.0	8,380	4.15	5,320
20							4.7	7,230	4.85	7,800	4.3	5,810
21					5.7		5.25	9,420	4.45	6,320	4.55	6,680
22	8.4						5.1	8,790	4.8	7,610	4.45	6,320
23	8.2						5.55	10,800	4.25	5,640	5.15	9,000
24	9.3						6.2	13,900	4.3	5,810	5.2	9,210
25	8.95		6.2				6.0	12,900	4.8	7,610	5.2	9,210
26	8.1				6.8		5.95	12,600	5.05	8,580	4.4	6,150
27	7.6						5.9	12,400	5.8	11,900	4.4	6,150
28					7.3		6.3	14,400	5.2	9,210	4.15	5,320
29	7.0						5.85	12,200	5.6	11,000	3.85	4,400
30					7.2		5.9	12,400	5.4	10,100	3.95	4,700
31					7.7				5.85	12,200		

NOTE.—Ice existed from Jan. 1 to Apr. 1, during which period readings were made to water surface. The ice ranged in thickness from 1.2 feet to 2.4 feet. Considerable fluctuation and error in gage heights was caused by operations at Indian Lake for logging during May and June.

Daily discharge determined from a well-defined discharge rating curve. The figures may, however, be considerably in error as a result of fluctuation of water surface caused by logging operations at Moosehead and Indian lakes.

Discharge Apr. 1 affected by ice.

Monthly discharge of Kennebec River at Bingham, Maine, for 1910.

[Drainage area, 2,660 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January			3,250	1.22	1.41	D.
February			2,900	1.09	1.14	D.
March			3,400	1.28	1.48	D.
April	18,100	4,550	10,200	3.84	4.28	C.
May	13,900	5,640	9,970	3.75	4.32	B.
June	12,900	4,400	7,420	2.79	3.11	B.

NOTE.—The discharge for January to March was taken as the sum of the discharge of Kennebec River at The Forks, of Dead River at The Forks, and of an estimated inflow below these two stations and above Bingham.

This table supersedes discharge table published in the first annual report of the Maine State Water Storage Commission.

KENNEBEC RIVER AT WATERVILLE, MAINE.

Observations of the flow of Kennebec River at Waterville have been made by the Hollingsworth & Whitney Co. since November, 1891, and have been continuous since January 12, 1893. This company manufactures manila paper and ground-wood and sulphite pulp. The records for 1910 have been furnished for computation by George H. Marr, engineer for the company.

The station is located at the dam of the mill of Hollingsworth & Whitney Co. at Waterville, about 2 miles above the mouth of Sebasticook River. Messalonskee Stream enters about 3½ miles below the station.

The dam is of timber cribwork, the main portion having a vertical downstream face with a horizontal crest about 5.75 feet wide and an upstream slope of about 40° from the horizontal. The average elevation of the crest of the dam, as determined by levels during July, 1906, was 119.37 feet above the Hollingsworth & Whitney datum, or 71.53 feet above mean sea level, according to the Kennebec datum as corrected by levels of 1906. The total length of the dam is 800 feet, which includes a width of logway of 34 feet. Flashboards are kept on the dam a greater part of the time, their average elevation in July, 1906, being 123.73 feet above the Hollingsworth & Whitney datum, or 75.89 feet above mean sea level. The crest of the dam is in fairly good condition. The leakage has never been measured, but is assumed arbitrarily as 100 second-feet. The water which flows in the canals is used through 46 wheels, most of which have been rated at Holyoke under practically the same head, the average head at Waterville being about 23 feet. Some water is lost from the canal through small waste gates and over wasteweirs. A small amount, estimated at 100 second-feet, is used for washing and mill purposes.

Methods and diagrams for estimating the flow through the wheels and over the dam were developed by the late Sumner Hollingsworth, engineer for the company. Observations were made at 12 o'clock noon of each day, that hour having been chosen after investigation as a time when the flow is least affected by storage of dams upstream and as giving most nearly the average for the day. When the flow of the river is less than about 3,500 second-feet, all of the water is used through the wheels.

Prior to 1906 some errors occurred in computing discharge data at this point, owing to the use of inaccurate information regarding flashboards, and the records are considered as only fair. Since 1906 more care has been taken, and the present results are fairly good.

The maximum crest discharge since records have been kept occurred from 7 until 9 a. m. December 16, 1901, and was 156,800 second-feet.

The average discharge during the 24 hours of that day was 127,000 second-feet. This was probably the greatest flood occurring in the last hundred years on the Kennebec, and even with this great discharge much of the flood flow above Moosehead Lake (some 1,240 square miles of drainage area) was being held in the lake. (See Water-Supply Paper 198 for discussion of this flood.)

The discharge for the minimum week occurred December 14 to 20, 1903, and averaged 638 second-feet.

Data prior to 1907 have been compiled in Water-Supply Paper 198.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of Kennebec River at Waterville, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,730	8,620	6,000	29,400	[a]23,000	18,200	6,940	3,590	2,450	3,060	3,180	2,170
2	[a]1,300	6,510	6,710	34,500	20,300	17,600	6,140	4,220	2,980	[a]3,650	2,660	2,520
3	3,150	5,580	7,700	[a]34,700	19,600	17,300	[a]2,940	5,700	2,640	2,720	2,670	2,520
4	3,030	4,910	7,640	27,100	18,100	15,500	9,240	5,610	[a]3,290	2,740	2,360	[a]1,010
5	2,830	5,520	8,090	25,700	21,000	[a]14,300	5,550	9,210	3,130	2,770	2,690	2,480
6	2,720	[a]4,790	[a]6,900	28,800	19,700	11,000	7,730	0,900	2,720	2,740	[a]2,780	2,540
7	2,920	4,870	8,090	36,000	18,500	11,300	3,770	[a]7,360	3,380	2,570	3,530	1,900
8	2,840	4,820	9,290	29,700	[a]15,700	13,200	7,150	6,890	3,060	2,670	3,700	1,840
9	[a]2,170	4,800	8,820	33,500	15,800	11,700	8,690	5,930	2,670	[a]1,630	3,730	194
10	3,020	4,540	7,400	[a]28,200	16,500	10,900	[a]6,200	4,130	2,990	2,800	2,840	1,420
11	3,010	4,820	6,500	22,000	17,000	10,400	7,800	3,700	[a]2,010	2,750	2,770	[a]1,380
12	3,010	4,810	4,910	18,900	17,100	[a]10,400	5,600	3,660	2,560	2,420	3,160	1,650
13	2,900	[a]3,420	[a]5,100	16,300	16,500	12,300	6,600	3,470	2,370	2,490	[a]592	1,940
14	2,770	4,750	6,050	9,690	15,300	12,900	3,500	[a]6,260	2,690	2,450	3,920	1,670
15	2,740	4,450	6,100	11,900	[a]12,800	11,700	5,420	3,190	2,360	2,440	2,790	2,330
16	[a]1,510	4,760	6,030	11,100	12,600	11,000	5,420	3,880	2,290	[a]237	2,780	1,350
17	2,870	4,480	5,720	[a]11,000	10,700	9,470	[a]3,640	3,700	2,630	2,750	3,030	2,380
18	2,800	4,460	5,660	6,550	10,300	12,400	5,570	3,480	[a]2,190	3,450	2,300	[a]1,310
19	3,100	4,360	4,590	12,000	11,800	[a]12,300	3,640	3,570	3,180	2,510	2,100	1,620
20	3,000	[a]3,280	[a]4,490	11,700	11,400	11,800	3,590	3,620	2,600	2,510	[a]242	2,310
21	3,120	4,540	5,720	16,200	11,300	10,400	3,480	[a]1,280	2,650	2,440	1,710	1,740
22	4,230	4,600	6,500	18,400	[a]8,190	10,700	3,560	3,780	2,670	2,390	1,730	2,280
23	[a]23,300	4,660	6,530	24,100	10,600	10,700	3,360	3,760	2,370	[a]927	1,620	1,880
24	18,700	4,620	6,880	[a]23,000	9,820	12,200	[a]1,920	2,940	2,340	2,730	2,410	1,530
25	14,500	4,060	12,300	24,100	6,340	12,300	4,510	2,290	[a]312	2,820	2,130	[a]1,440
26	12,500	3,660	17,200	19,900	7,800	[a]8,670	4,820	3,370	100	2,970	1,890	1,320
27	9,820	[a]3,650	[a]30,600	26,300	13,400	7,900	6,480	2,720	2,350	3,060	[a]1,000	2,820
28	8,310	4,970	23,600	28,700	16,400	8,690	6,700	[a]172	2,370	2,850	1,880	2,480
29	8,270	.....	21,000	25,300	[a]14,900	6,840	6,630	2,620	3,270	2,990	3,340	2,430
30	[a]7,230	.....	29,300	23,100	12,500	6,860	5,640	3,050	2,720	[a]1,400	4,010	2,730
31	7,000	.....	30,100	.....	12,800	.....	[a]3,800	2,600	.....	3,110	.....	2,770

[a] Sunday.

Monthly discharge of Kennebec River at Waterville, Maine, for 1910.

[Drainage area, 4,270 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	23,300	1,300	5,530	1.30	1.50
February	8,620	3,280	4,760	1.11	1.16
March	30,600	4,490	10,400	2.44	2.81
April	36,000	6,550	22,300	5.22	5.82
May	23,000	6,340	14,400	3.37	3.88
June	18,200	6,840	11,700	2.74	3.06
July	9,240	1,920	5,360	1.26	1.45
August	10,900	172	4,210	.986	1.14
September	3,380	100	2,510	.588	.66
October	3,650	237	2,550	.597	.69
November	4,010	242	2,520	.590	.66
December	2,820	194	1,930	.452	.52
The year	36,000	100	7,350	1.72	23.35

KENNEBEC RIVER AT GARDINER, MAINE.

A very interesting record has been kept for 126 years of the dates of opening and closing of navigation or the disappearance and formation of ice on the lower Kennebec River. The first records were published in the old town histories of Gardiner and observations have been maintained to the present time. The following table gives this record since 1785:

Dates of opening and closing of Kennebec River at Gardiner, Maine.

Closed.	Opened.	Days closed.	Closed.	Opened.	Days closed.
	1785, Apr. 24		1810, Dec. 9	1811, Mar. 24	105
	1786, Mar. 21		1811, Dec. 14	1812, Apr. 18	126
1786, Nov. 18	1787, Apr. 7	140	1812, Dec. 10	1813, Apr. 11	122
	1789, Apr. 4		1813, Dec. 13 *e*	1813, Dec. 15	108
1791, Jan. 5	1791, Apr. 18	103	1813, Dec. 21	1814, Apr. 6	
1791, Dec. 10	1792, Apr. 3	115	1814, Dec. 4	1815, Apr. 18	135
1792, Nov. 23 *a*	1793, Apr. 1	126	1815, Dec. 2	1816, Apr. 20	140
1793, Dec. 10			1816, Nov. 29	1817, Apr. 17	139
1795, Jan. 4 *b*	1795, Apr. 6	92	1817, Nov. 25 *f*	1817, Nov. 30	131
	1796, Apr. 1		1817, Dec. 7	1818, Apr. 12	
1796, Nov. 28	1797, Apr. 4	128	1818, Dec. 4	1818, Dec. 6	126
1797, Nov. 22	1798, Apr. 12	142	1818, Dec. 10	1819, Apr. 14	
1798, Nov. 23	1799, Apr. 13	142	1819, Dec. 5	1820, Apr. 15	132
1799, Nov. 24	1800, Apr. 10	138	1820, Nov. 16 *g*	1820, Nov. 17	134
1800, Nov. 28 *c*	1800, Dec. 13	113	1820, Nov. 29	1821, Apr. 11	
1801, Jan. 2	1801, Apr. 10		1821, Dec. 1	1822, Mar. 19	109
1801, Dec. 10	1802, Mar. 28	108	1822, Dec. 6	1823, Apr. 11	126
1802, Dec. 16	1803, Mar. 22	96	1823, Nov. 16	1824, Mar. 28	134
1803, Nov. 16 *d*	1803, Dec. 13	138	1824, Dec. 1	1824, Dec. 3	119
1803, Dec. 22	1804, Apr. 12		1824, Dec. 9	1825, Apr. 5	
1804, Nov. 19	1805, Apr. 2	134	1825, Nov. 23	1825, Nov. 28	116
1806, Jan. 2	1806, Mar. 15	72	1825, Dec. 12	1826, Apr. 2	
	1807, Apr. 7		1826, Dec. 4	1826, Dec. 10	96
1807, Dec. 18	1808, Mar. 29	102	1826, Dec. 29	1827, Mar. 29	
1808, Dec. 6	1809, Apr. 17	132	1827, Nov. 24	1827, Nov. 30	116
1809, Nov. 23	1810, Apr. 9	137	1827, Dec. 6	1828, Mar. 25	

a Opened after closing in 1792.
b Jan. 4, 1795, opened to within 2 miles of Nahumkeag Island.
c Opened Dec. 13, 1800. Plowing at Christmas.
d Vessels came up to Gardiner Dec. 2, 1803; whole river opened Dec. 13, 1803, and closed Dec. 22, 1803.
e Vessels came up to Gardiner Dec. 15, 1813.
f River broke up from Gardiner Nov. 30, 1817; vessels came up to Gardiner December, 1817; whole river broke up Dec. 7, 1817, and closed the same day.
g River opened Nov. 17, 1820, from Gardiner, and the whole river opened Nov. 20, 1820.

Dates of opening and closing of Kennebec River at Gardiner, Maine—Continued.

Closed.	Opened.	Days closed.	Closed.	Opened.	Days closed.
1828, Dec. 3	1829, Apr. 12	131	1873, Nov. 19	1874, Apr. 3	134
1829, Dec. 3	1830, Apr. 1	120	1874, Dec. 1	1874, Dec. 3	133
1830, Dec. 13 [a]	1830, Dec. 15	88	1874, Dec. 5	1875, Apr. 14	
1830, Dec. 19	1830, Dec. 27		1875, Nov. 22	1876, Apr. 7	137
1831, Jan. 11	1831, Mar. 30		1876, Dec. 1	1876, Dec. 2	111
1831, Dec. 2	1832, Apr. 14	134	1876, Dec. 9	1877, Mar. 28	
1832, Dec. 2	1833, Apr. 5	124	1877, Dec. 10	1878, Mar. 16	96
1833, Dec. 14	1834, Apr. 3	110	1878, Dec. 18	1879, Apr. 10	113
1834, Dec. 8		138	1879, Dec. 18	1880, Mar. 24	104
1835, Nov. 23	1836, Apr. 9		1880, Mar. 25	1880, Mar. 31	
1836, Nov. 23	1837, Apr. 14	142	1880, Nov. 23	1881, Mar. 22	119
1837, Nov. 27	1838, Apr. 3	127	1881, Nov. 28	1881, Dec. 1	113
1838, Nov. 24	1839, Apr. 6	133	1881, Dec. 11	1881, Dec. 14	
1839, Dec. 18	1840, Mar. 31	104	1881, Dec. 16	1881, Dec. 30	
1840, Nov. 28	1841, Apr. 5	129	1882, Jan. 2	1882, Apr. 5	
1841, Dec. 1	1841, Dec. 3	105	1882, Dec. 1	1883, Apr. 14	134
1841, Dec. 7	1841, Dec. 11		1883, Dec. 2	1884, Apr. 7	127
1841, Dec. 11	1842, Mar. 20		1884, Dec. 13	1885, Apr. 16	124
1842, Nov. 28	1843, Apr. 19	142	1885, Dec. 12 [d]	1886, Apr. 16	125
1843, Nov. 30	1844, Apr. 9	131	1886, Dec. 2	1887, Apr. 21	140
1844, Nov. 27	1845, Mar. 31	124	1887, Dec. 1	1887, Dec. 5	120
1845, Dec. 7	1846, Mar. 28	111	1887, Dec. 22	1888, Apr. 15	
1846, Dec. 2	1847, Apr. 20	139	1888, Nov. 22	1888, Nov. 28	93
1847, Dec. 21	1848, Apr. 1	102	1888, Dec. 13	1889, Jan. 10	
1848, Dec. 22	1849, Mar. 30	98	1889, Jan. 20	1889, Mar. 20	
1849, Dec. 8	1850, Apr. 3	116	1889, Dec. 4	1889, Dec. 9	111
1850, Dec. 8	1851, Apr. 6	119	1889, Dec. 14	1889, Dec. 22	
1851, Dec. 1	1852, Apr. 12	133	1889, Dec. 27	1890, Apr. 4	
1852, Dec. 16	1853, Mar. 29	103	1890, Dec. 2	1891, Apr. 3	122
1853, Nov. 27	1853, Nov. 30	141	1891, Dec. 17	1891, Dec. 25	89
1853, Dec. 4	1854, Apr. 21		1892, Jan. 9	1892, Mar. 30	
1854, Dec. 3	1855, Apr. 9	127	1892, Dec. 18	1893, Apr. 12	115
1855, Nov. 23 [b]	1855, Dec. 10	137	1893, Dec. 4	1894, Mar. 23	109
1855, Dec. 11	1856, Apr. 9		1894, Nov. 30	1895, Apr. 8	129
1856, Dec. 1	1857, Apr. 5	125	1895, Dec. 6 [e]	1895, Dec. 27	85
1857, Dec. 5	1858, Apr. 3	119	1896, Jan. 5	1896, Mar. 9	
1858, Nov. 30	1859, Mar. 31	121	1896, Dec. 7	1897, Apr. 3	117
1860, Dec. 6	1861, Apr. 7	122	1897, Dec. 2	1897, Dec. 11	97
1861, Dec. 12	1862, Apr. 18	127	1897, Dec. 20	1898, Mar. 18	
1862, Dec. 3	1863, Apr. 13	131	1898, Dec. 12	1899, Apr. 11	120
1863, Dec. 3	1863, Dec. 5	114	1899, Dec. 27	1900, Apr. 2	96
1863, Dec. 6	1863, Dec. 15		1900, Dec. 6	1901, Apr. 4	119
1863, Dec. 17	1864, Mar. 29		1901, Nov. 28 [f]	1901, Dec. 15	100
1864, Dec. 12	1865, Mar. 22	100	1901, Dec. 20	1902, Mar. 12	
1865, Dec. 8	1866, Mar. 31	113	1902, Dec. 6	1903, Mar. 14	98
1866, Dec. 13	1867, Apr. 10	118	1903, Nov. 28	1904, Apr. 6	131
1867, Dec. 1	1868, Apr. 15	137	1904, Dec. 5	1905, Apr. 7	123
1868, Dec. 2	1869, Apr. 11	130	1905, Dec. 10	1906, Apr. 5	116
1869, Dec. 4 [c]	1870, Jan. 4	117	1906, Dec. 3	1907, Apr. 15	133
1870, Jan. 8	1870, Feb. 20		1907, Dec. 3	1908, Mar. 28	116
1870, Feb. 21	1870, Apr. 5		1908, Dec. 11	1909, Apr. 2	112
1870, Dec. 16	1871, Mar. 12	86	1909, Dec. 22	1910, Mar. 20	89
1871, Nov. 29	1872, Apr. 16	140	1910, Dec. 4	1911, Apr. 15	133
1872, Dec. 1	1872, Dec. 2	130			
1872, Dec. 7	1873, Apr. 15				

[a] Two vessels arrived from Boston Jan. 1, 1831.
[b] Opened Dec. 10, 1855. Vessels came up to Gardiner.
[c] Opened Feb. 20, 1870, above and for 3 miles below Gardiner.
[d] The ice broke up Jan. 6, 1886, and jammed at Swan Island, the jam extending nearly to Hallowell and completely ruining the ice crop above Swan Island.
[e] The ice broke Mar. 2, 1896, jamming at Swan Island and making the greatest flood at Gardiner ever known, carrying away the Gardiner and Randolph bridge.
[f] 1902. Biggest freshet, except the above, ever known on the Kennebec. Drift ice jammed from Richmond to Augusta.

NOTE.—Average length of time closed 120 days per year. Greatest length of time closed 142 days, Nov. 22, 1797, to Apr. 12, 1798, and Nov. 23, 1798, to Apr. 13, 1799. Shortest length of time closed 72 days, Jan. 2, 1806, to Mar. 15, 1806.
Earliest date closed Nov. 16, 1803, 1820, 1823.
Latest date first closed Jan. 5, 1791.
Earliest date opened Mar. 9, 1896.
Latest date opened Apr. 24, 1785.

DEAD RIVER NEAR THE FORKS, MAINE.

This station, which is located one-eighth mile above the farmhouse of Jeremiah Durgin and 1½ miles west of The Forks, was established September 29, 1901, discontinued August 15, 1907, and reestablished March 16, 1910.

The gage is an inclined staff bolted to a large bowlder on the left bank.

Its datum has remained unchanged since the establishment of the station.

Discharge measurements are made from a car suspended from a cable.

The bed is of gravel and small bowlders. The banks are medium high and overflow only at extreme high water.

During the winter months the discharge is affected by ice. It is also affected at times by log driving.

Conditions for obtaining accurate discharge data during unobstructed periods are good, and a good discharge rating curve has been developed. The 1910 discharge measurements confirmed the 1907 discharge rating curve, and the latter is used in this year's computations.

Data prior to 1907 have been compiled in Water-Supply Paper 198.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of Dead River near The Forks, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 17	F. E. Pressey	234	681	1.77	1,560
June 28	W. E. Parsons	227	492	1.25	854
Aug. 17	do	220	354	.79	320
18	do	220	359	.79	346
18	do	220	361	.79	354

Daily gage height, in feet, of Dead River near The Forks, Maine, for 1910.

[Jeremiah Durgin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				4.25	4.4	3.2	1.2	0.8	1.0	0.7	0.9	0.9
2				4.7	3.8	3.0	1.1	.9	.9	.7	.8	1.1
3				4.65	3.1	2.95	1.25	.9	1.0	.6	.9	1.1
4				3.55	2.55	2.6	1.3	1.0	1.0	.6	.9	1.2
5				2.9	3.45	2.45	1.1	1.0	.9	.5	.8	1.1
6				5.35	1.95	2.3	1.15	1.0	1.0	.6	.9	1.2
7				4.8	2.65	2.05	1.1	1.05	1.0	.5	.9	1.2
8				5.7	3.5	2.0	1.0	1.2	.9	.6	1.0	1.3
9				4.6	2.3	1.9	1.1	1.1	1.0	.5	.9	1.4
10				4.2	2.25	1.75	1.0	1.05	.9	.6	1.0	1.4
11				3.8	3.65	1.8	.9	1.1	.8	.6	.9	1.3
12				3.5	2.1	1.8	1.0	.95	.9	.5	.95	1.3
13				2.5	2.4	1.8	.9	.95	.7	.6	.8	1.3
14				2.5	2.05	2.2	1.0	.8	.8	.5	.85	1.2
15				2.6	2.95	2.0	.8	.9	.8	.6	.8	1.3

Daily gage height, in feet, of Dead River near The Forks, Maine, for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	.....	.....	1.2	2.6	1.85	1.8	0.9	0.85	0.7	0.5	0.7	1.1
17	.....	.....	1.1	2.25	1.8	1.85	.9	.7	.8	.5	.8	1.1
18	.....	.....	1.1	3.3	1.85	1.7	.8	.8	.7	.5	.7	1.1
19	.....	.....	1.0	4.0	1.95	1.7	.9	.7	.8	.5	.8	1.0
20	.....	.....	1.1	2.95	1.9	1.6	.8	.8	.8	.5	.8	1.0
21	.....	.....	1.1	2.7	1.8	1.6	.7	.8	.65	.5	.8	.9
22	.....	.....	1.2	3.4	3.7	1.5	.8	.7	.7	.5	.9	1.0
23	.....	.....	1.2	4.6	1.9	1.5	.7	.8	.65	.5	.8	.9
24	.....	.....	1.45	4.1	1.8	1.5	.8	.7	.5	.5	.9	1.0
25	.....	.....	2.25	4.6	1.9	1.35	.7	.8	.7	.5	.9	1.0
26	.....	.....	2.7	3.4	3.9	1.45	.8	.8	.7	.5	.8	1.25
27	.....	.....	2.8	4.0	4.3	1.45	.8	.6	.6	.6	.9	1.35
28	.....	.....	2.7	3.7	4.2	1.2	.7	.7	.7	.6	.9	1.45
29	.....	.....	2.7	4.15	4.0	1.3	.8	.6	.6	.8	1.0	1.6
30	.....	.....	3.0	4.45	3.15	1.1	.7	.7	.7	.8	1.0	1.6
31	.....	.....	3.3	.....	4.55	.....	.8	.9	.....	.9	.....	1.55

NOTE.—Gage heights probably unaffected by ice Mar. 16 to 31. On Apr. 21, 26, 30, and May 6, 9, 17, and 26 water was released from the dam above for short periods, and hence the recorded gage heights are liable to considerable error. Relation between gage height and discharge probably affected by ice throughout the month of December. The gage readings for December are probably to water surface.

Daily discharge, in second-feet, of Dead River near The Forks, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	7,230	7,730	4,240	825	365	580	270	470	.....
2	.....	.....	.....	8,780	5,830	3,790	700	470	470	270	365	.....
3	.....	.....	.....	8,600	4,010	3,680	800	470	500	185	470	.....
4	.....	.....	.....	5,120	2,880	2,970	955	580	500	185	470	.....
5	.....	.....	.....	3,570	4,860	2,690	700	580	470	185	365	.....
6	.....	.....	.....	11,300	5,190	2,430	762	580	580	185	470	.....
7	.....	.....	.....	9,140	3,060	2,020	700	640	580	110	470	.....
8	.....	.....	.....	12,000	4,990	1,940	500	825	470	185	500	.....
9	.....	.....	.....	8,420	6,270	1,900	700	700	580	110	470	.....
10	.....	.....	.....	7,060	2,040	1,580	580	640	470	185	500	.....
11	.....	.....	.....	5,830	5,400	1,650	470	700	365	185	470	.....
12	.....	.....	.....	4,990	2,100	1,650	580	525	470	110	525	.....
13	.....	.....	.....	2,780	2,060	1,650	470	525	270	185	365	.....
14	.....	.....	.....	2,780	2,020	2,260	580	365	365	110	418	.....
15	.....	.....	.....	2,970	3,680	1,940	365	470	365	185	365	.....
16	.....	.....	825	2,970	1,720	1,650	470	418	270	110	270	.....
17	.....	.....	700	2,340	4,260	1,720	470	270	365	110	365	.....
18	.....	.....	700	4,480	1,720	1,500	365	365	270	110	270	.....
19	.....	.....	580	6,430	1,870	1,500	470	270	365	110	365	.....
20	.....	.....	700	3,580	1,800	1,360	365	365	365	110	365	.....
21	.....	.....	700	4,660	1,650	1,360	270	365	228	110	365	.....
22	.....	.....	825	4,730	5,540	1,220	365	270	270	110	470	.....
23	.....	.....	825	8,420	1,800	1,220	270	365	228	110	365	.....
24	.....	.....	1,160	6,740	1,650	1,220	365	270	110	110	470	.....
25	.....	.....	2,340	8,420	1,800	1,020	270	365	270	110	470	.....
26	.....	.....	3,160	6,490	7,830	1,160	365	365	270	110	365	.....
27	.....	.....	3,360	6,430	7,400	1,160	365	185	185	185	470	.....
28	.....	.....	3,160	5,540	7,060	825	270	270	270	185	470	.....
29	.....	.....	3,160	6,900	6,430	955	365	185	185	365	580	.....
30	.....	.....	3,790	9,270	4,120	700	270	270	270	365	580	.....
31	.....	.....	4,480	.....	8,250	.....	365	470	.....	470	.....	.....

NOTE.—Daily discharge determined from the 1907 discharge rating curve, which is well defined.
For Apr. 21, 26, 30, and May 6, 9, 17, and 26 the daily discharge was computed by applying the rating table to the several gage readings taken during the day and weighting these values in accordance with the proportional part of the day to which each gage height is applicable.

Monthly discharge of Dead River near The Forks, Maine, for 1910.

[Drainage area, 878 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	1,000	1.14	1.31	D.
February	.....	.....	900	1.03	1.07	D.
March	4,480	580	1,470	1.67	1.92	D.
April	12,800	2,340	6,300	7.18	8.01	C.
May	8,250	1,650	4,120	4.69	5.41	C.
June	4,240	700	1,830	2.08	2.32	B.
July	955	270	501	.571	.66	A.
August	825	185	436	.497	.57	A.
September	580	110	371	.423	.47	A.
October	470	110	173	.197	.23	B.
November	580	270	436	.497	.55	A.
December	.....	.....	200	.228	.26	D.
The year	12,800	.....	1,470	1.67	22.78	

NOTE.—The discharge during the winter periods is determined from a study of climatological, storage, and discharge records at other stations in the Kennebec drainage.
Mean discharge, Mar. 1–15, estimated, 1,000 second-feet.

SANDY RIVER NEAR FARMINGTON, MAINE.

Sandy River rises in western part of Franklin County, in the hilly region east of Rangeley Lake, flows southeastward about 32 miles, then northeastward 17 miles, and enters the Kennebec about 3 miles below Madison. Its drainage area comprises 670 square miles. No large streams or ponds are tributary to this river. The total fall is about 1,600 feet, mostly in upper part of basin.

The gaging station, which is located at the Fairbanks highway bridge, 3 miles above Farmington, was established July 11, 1910.

A standard chain gage is used.

Discharge measurements are made from the lower side of the bridge.

The left bank is high and rocky; the right is subject to overflow in extreme freshet stages. During low water the current is sluggish at the bridge. The channel is about 194 feet wide and is broken by one pier.

The discharge at this station is affected by ice during the winter months.

Discharge measurements of Sandy River near Farmington, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage. height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 22	F. E. Pressey	164	250	3.32	267
July 11	do	45	51	2.42	73
15	W. E. Parsons	45	52	2.45	73
29	do	50	65	2.64	120
Aug. 5	do	174	368	3.89	546
25	do	40	48	2.35	58
25	do	60	43	2.35	63

Daily gage height, in feet, and discharge, in second-feet, of Sandy River near Farmington, Maine, for 1910.

[L. A. Daggett, observer.]

Day.	July.		Aug.		Sept.		Oct.		Nov.		Dec.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	2.4	67	2.2	40	2.3	53	2.5	82	2.6	100
2	.....	.....	2.35	60	2.25	46	2.4	67	2.4	67	2.55	91
3	.....	.....	2.35	60	2.25	46	2.4	67	2.4	67	2.5	82
4	.....	.....	2.7	119	2.3	53	2.4	67	2.4	67	2.5	82
5	.....	.....	3.8	488	2.4	67	2.4	67	2.7	119	2.5	82
6	.....	.....	3.0	180	2.4	67	2.35	60	3.4	298	2.45	74
7	.....	.....	2.8	138	2.6	100	2.35	60	3.0	180	2.4	67
8	.....	.....	2.8	138	2.55	91	2.3	53	2.8	138	2.3	53
9	.....	.....	2.6	100	2.5	82	2.3	53	2.7	119	2.3	53
10	.....	.....	2.5	82	2.4	67	2.3	53	2.6	100	2.3	53
11	2.4	67	2.5	82	2.4	67	2.3	53	2.5	82	2.3	53
12	2.5	82	2.5	82	2.3	53	2.3	53	2.6	100	2.3	53
13	2.45	74	2.5	82	2.25	46	2.3	53	2.6	100	2.3	53
14	2.55	91	2.4	67	2.5	82	2.25	46	2.5	82	.....	.....
15	2.5	82	2.6	100	2.7	119	2.25	46	2.5	82	.....	.....
16	2.4	67	3.3	262	2.6	100	2.3	53	2.4	67	.....	.....
17	2.4	67	3.1	202	2.4	67	2.2	40	2.3	53	2.5	.....
18	2.35	60	2.6	100	2.3	53	2.2	40	2.5	82	.....	.....
19	2.35	60	2.7	119	2.35	60	2.2	40	2.3	53	.....	.....
20	2.35	60	2.7	119	2.3	53	2.25	46	2.3	53	.....	.....
21	2.35	60	2.55	91	2.3	53	2.25	46	2.25	46	.....	.....
22	2.4	67	2.5	82	2.3	53	2.25	46	2.3	53	.....	.....
23	2.45	74	2.4	67	2.3	53	2.25	46	2.3	53	.....	.....
24	2.45	74	2.4	67	2.25	46	2.3	53	2.4	67	2.8	.....
25	2.4	67	2.35	60	2.25	46	2.3	53	2.4	67	.....	.....
26	2.3	53	2.3	53	2.3	53	2.5	82	2.4	67	.....	.....
27	2.3	53	2.3	53	2.35	60	2.6	100	2.35	60	.....	.....
28	2.4	67	2.3	53	2.4	67	2.65	110	2.4	67	.....	.....
29	2.6	100	2.3	53	2.5	82	2.7	119	2.5	82	.....	.....
30	2.4	67	2.25	46	2.5	82	2.7	119	2.5	82	.....	.....
31	2.4	67	2.25	46	.....	.....	2.6	100	.....	.....	.....	.....

NOTE.—The relation between gage height and discharge was affected by ice Dec. 14 to 31. There may also have been some effect from ice Dec. 4 to 13. Gage heights Dec. 17 and 24 to water surface. Ice 1 foot thick at gage Dec. 17. About 1 foot of water over ice Dec. 24.

Daily discharge determined from a well-defined discharge rating curve. Discharges Dec. 4 to 13 may be somewhat in error because of the presence of ice.

Monthly discharge of Sandy River near Farmington, Maine, for 1910.

[Drainage area, 270 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
July 11-31	100	53	69.5	0.257	0.20	A.
August	488	46	107	.396	.46	A.
September	119	40	65.1	.241	.27	A.
October	119	40	62.7	.232	.27	A.
November	298	46	87.8	.325	.36	A.
December	100	.....	62.8	.233	.27	D.

NOTE.—The discharge from Dec. 14 to 31 was estimated from climatologic records and records of discharge in adjacent drainage basins. There may also have been some effect from ice from Dec. 4 to 13. Mean discharge Dec. 14 to 31, estimated, 58 second-feet.

SEBASTICOOK RIVER AT PITTSFIELD, MAINE.

Sebasticook River rises in ponds in southeastern Somerset and western Penobscot counties and flows in a general southwesterly direction 45 miles to Kennebec River at Winslow, opposite Waterville. It is the largest tributary of the Kennebec, and it is also one of the most fully developed for power. Out of a total fall of 170 feet between Moose Pond and the Kennebec only about 50 feet remain undeveloped. Storage facilities are good but have been only in part utilized. The basin is largely in farm lands.

The gaging station, which was established July 3, 1908, is located at the steel highway bridge just above the Maine Central Railroad Bridge across the river in the town of Pittsfield, Maine.

About 800 feet upstream from the highway bridge is a dam which furnishes power to the Robert Dobson Co. and the Smith Woolen Co.; the dam of the Waverly woolen mill is about one-half mile farther upstream. About 5 miles below the station and 2 miles from Burnham is the Sebasticook Power Co.'s dam. There is a clear fall below the gage, and the dam below has no effect on the discharge.

The chain gage datum has remained the same since the establishment of the station.

Discharge measurements are made from the highway bridge.

Conditions are good for obtaining accurate discharge data, and a fairly well-defined discharge rating curve has been developed for medium stages, although more measurements are desirable to determine the flow at low and high stages. Owing to the proximity of the dam above and the rapid fall of the stream, the discharge at the gaging station is probably not materially affected by ice.

Information in regard to this station is contained in the annual reports of the Maine State Water-Storage Commission.

Discharge measurements of Sebasticook River at Pittsfield, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 27	F. E. Pressey	108	290	4.31	1,050
Mar. 14	do	108	231	3.87	647
June 7	do	105	181	3.38	394
July 25	W. E. Parsons	102	170	3.20	304

Daily gage height, in feet, of Sebasticook River at Pittsfield, Maine, for 1910.

[Easter B. Morrill, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.25	4.0	3.65	5.4	4.2	3.35	3.4	3.25	2.95	2.9	2.65	2.9
2	2.9	4.0	3.65	5.5	4.3	3.3	3.05	3.25	3.05	2.85	2.7	2.95
3	3.2	4.0	3.7	5.6	4.3	3.4	2.75	3.1	2.95	2.95	2.7	2.85
4	3.3	3.95	3.7	5.55	4.3	3.35	2.85	3.25	2.75	2.95	2.65	2.2
5	3 4	3.85	3.55	5.4	4.2	2.75	2.95	3.15	2.9	2.9	2.6	2.85
6	3.35	3.6	3.4	5.35	4.1	3.15	3.25	3.25	2.95	3.0	2.5	2.95
7	3.4	3.75	3.85	5.2	3.95	3.15	3.2	3.15	2.9	2.9	2.65	2.95
8	3.3	3.75	4.05	5.05	3.9	3.15	3.15	3.15	3.05	2.9	2.65	2.55
9	2.9	3.8	4.1	4.85	4.0	3.2	3.05	3.25	2.95	2.5	2.65	2.4
10	3.15	3.65	4.05	4.8	3.9	3.15	2.95	3.25	2.9	2.7	2.65	2.35
11	3.35	3.6	3.95	4.75	3.85	3.1	3.2	3.2	2.75	2.85	2.7	2.3
12	3.4	3.5	3.9	4.55	3.85	2.85	3.25	3.25	2.95	2.75	2.6	2.5
13	3.3	3.35	3.6	4.45	3.8	3.5	3.2	3.1	3.0	2.7	2.3	2.45
14	3.3	3.65	3.9	4.35	3.8	3.05	3.05	2.6	3.0	2.5	2.45	2.45
15	3.15	3.65	4.0	4.3	3.5	2.75	3.05	3.15	2.95	2.7	2.6	2.4
16	2.95	3.7	3.9	3.5	3.65	3.15	2.8	3.2	3.05	2.45	2.5	2.5
17	3.3	3.6	3.9	2.7	3.5	3.05	2.7	3.1	2.95	2.5	2.75	2.45
18	3.3	3.6	3.9	2.85	3.45	3.35	3.05	3.15	2.85	2.8	2.8	2.4
19	3.3	3.5	3.8	3.25	3.4	3.0	3.25	3.15	2.6	2.7	2.6	2.5
20	3.25	3.4	3.45	3.3	3.4	3.45	3.15	3.0	2.85	2.8	2.25	2.5
21	3.4	3.6	3.95	3.4	3.35	3.45	3.1	2.75	3.05	2.75	2.8	2.55
22	3.6	3.55	3.9	3.35	3.3	3.45	3.25	3.15	3.05	2.6	2.9	2.6
23	4.0	3.6	3.95	3.3	3.85	3.7	3.2	3.15	3.05	2.5	2.8	2.65
24	3.95	3.55	4.0	3.4	3.85	4.1	2.85	3.15	3.0	2.7	2.85	2.5
25	3.9	3.55	3.9	3.4	3.85	3.45	3.2	3.05	2.5	2.5	2.95	2.4
26	3.8	3.45	4.05	3.55	3.4	2.9	3.2	3.15	3.0	2.65	2.9	2.55
27	3.9	3.4	4.2	3.9	3.35	3.35	3.25	2.95	3.05	2.7	2.5	2.6
28	4.25	3.6	4.35	3.85	3.4	3.35	3.25	2.75	3.0	2.6	2.75	2.75
29	4.25	.....	4.75	4.05	3.15	3.45	3.2	3.0	3.0	2.55	2.85	2.95
30	4.25	.....	5.3	4.05	3.4	3.4	3.05	3.05	2.9	2.5	2.95	2.7
31	4.15	.....	5.3	.....	3.35	.....	2.8	3.05	.....	2.55	.....	2.25

Daily discharge, in second-feet, of Sebasticook River at Pittsfield, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	331	745	512	2,330	a 938	374	395	331	212	193	111	193
2	a 193	745	512	2,460	1,040	352	250	331	250	a 176	125	212
3	310	745	540	a 2,590	1,040	395	a 142	270	212	212	125	176
4	352	706	540	2,520	1,040	374	176	331	a 142	212	111	a 14
5	395	634	462	2,330	938	a 142	212	290	193	193	97	176
6	374	a 485	a 395	2,260	838	290	331	331	212	230	a 71	212
7	395	570	634	2,080	706	290	310	a 290	193	193	111	212
8	352	570	792	1,900	a 668	290	290	290	250	193	111	84
9	a 193	600	838	1,650	745	310	250	331	212	a 71	111	50
10	290	512	792	a 1,590	668	290	a 212	331	193	125	111	40
11	374	485	706	1,530	634	270	310	310	a 142	176	125	a 30
12	395	438	668	1,300	634	a 176	331	331	212	142	97	71
13	352	a 374	a 485	1,200	600	438	310	270	230	125	a 30	60
14	352	512	668	1,090	600	250	250	a 97	230	71	60	60
15	290	512	745	1,040	a 438	142	250	290	212	125	97	50
16	a 212	540	668	438	512	290	158	310	250	a 60	71	71
17	352	485	668	a 125	438	250	a 125	270	212	71	142	60
18	352	485	668	176	416	374	250	290	a 176	158	158	a 50
19	352	438	600	331	395	a 230	331	290	97	125	97	71
20	331	a 395	a 416	352	395	416	290	230	176	158	a 22	71
21	395	485	706	395	374	416	270	a 142	250	142	158	84
22	485	462	668	374	a 352	416	331	290	250	97	193	97
23	a 745	485	706	352	634	540	310	290	250	a 71	158	111
24	706	462	745	a 395	634	838	a 176	290	230	125	176	71
25	668	462	668	395	634	416	310	250	a 71	71	212	a 50
26	600	416	792	462	395	a 193	310	290	230	111	193	84
27	668	a 395	a 938	668	374	374	331	212	250	125	a 71	97
28	989	485	1,090	634	395	374	331	a 142	230	97	142	142
29	989	.....	1,530	792	a 290	416	310	230	230	84	176	212
30	a 989	.....	2,200	792	395	395	250	250	193	a 71	212	125
31	888	.....	2,200	.....	374	.....	a 158	250	.....	84	.....	22

a Sunday.

NOTE.—Daily discharge determined from a fairly well-defined rating curve between 70 and 1,100 second-feet. Below 70 second-feet the discharge figures are approximate, the rating curve having been extended by study of area and velocity curves. Above 1,100 second-feet the rating curve is based on one measurement at 3,860 second-feet and can be considered fairly well defined.

Monthly discharge of Sebasticook River at Pittsfield, Maine, for 1910.

[Drainage area, 320 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	989	193	473	1.48	1.71	B.
February	745	374	522	1.63	1.70	B.
March	2,200	395	792	2.48	2.86	A.
April	2,590	125	1,150	3.59	4.00	A.
May	1,040	290	598	1.87	2.16	B.
June	838	142	344	1.08	1.20	B.
July	395	125	266	.831	.96	B.
August	331	97	273	.853	.98	B.
September	250	71	206	.644	.72	B.
October	230	60	132	.412	.48	B.
November	212	22	122	.381	.42	B.
December	212	14	98.6	.308	.36	B.
The year	2,590	14	415	1.30	17.54	

NOTE.—The minima for many months are abnormally low, due to storage of water above the station on Sundays and other days.

The discharge during the winter months was probably unaffected by ice.

COBBOSSEECONTEE LAKE, MAINE.

Cobbosseecontee Lake is located in the towns of Winthrop, Manchester, West Gardiner, Litchfield, and Monmouth, is the largest body of water in the drainage basin of Cobbosseecontee Stream, and is the largest storage reservoir by which the flow of the stream is so well regulated in the interests of the water powers below. The area of the lake is 8.4 square miles at an elevation of 168 feet above mean sea level.

The following table shows the dates of closing in the fall and opening or disappearance of ice in the spring from this lake since 1839, from records furnished by J. E. Brainard, East Winthrop, Me.:

Dates of closing and opening of Cobbosseecontee Lake.

Closed.	Opened.	Days closed.	Closed.	Opened.	Days closed.
1839, Dec. 19	1840, Apr. 15	119	1875, Dec. 2	1876, May 1	152
1840, Dec. 2	1841, Apr. 28	148	1876, Dec. 12	1877, Apr. 18	128
1841, Dec. 20	1842, Apr. 16	118	1877, Dec. 26	1878, Apr. 14	110
1842, Nov. 28	1843, May 5	159	1878, Dec. 28	1879, May 5	129
1843, Nov. 2	1844, Apr. 22	173	1879, Dec. 16	1880, Apr. 22	129
1844, Nov. 29	1845, May 2	155	1880, Nov. 27	1881, Apr. 21	146
1845, Dec. 8	1846, Apr. 17	131	(1881) Jan. 2, 1882	1882, Apr. 28	117
1846, Dec. 10	1847, May 8	150	1882, Dec. 5	1883, May 1	148
1847, no record	1848, no record	.....	1883, Dec. 16	1884, Apr. 26	133
1848, no record	1849, no record	.....	1884, Dec. 18	1885, Apr. 29	133
1849, no record	1850, May 1	.....	1885, Dec. 14	1886, Apr. 20	128
1850, Dec. 13	1851, Apr. 21	130	1886, Dec. 5	1887, May 7	154
1851, Dec. 5	1852, May 3	151	1887, Dec. 24	1888, May 9	138
1852, Dec. 16	1853, Apr. 20	126	1888, Dec. 20	1889, Apr. 15	117
1853, Dec. 5	1854, May 8	155	(1889) Jan. 9, 1890	1890, Apr. 26	108
1854, Dec. 7	1855, Apr. 25	140	1890, Dec. 3	1891, Apr. 28	147
1855, Dec. 5	1856, Apr. 26	144	(1891) Jan. 1, 1892	1892, Apr. 18	109
1856, Dec. 2	1857, Apr. 17	137	1892, Dec. 22	1893, May 4	134
1857, Dec. 16	1858, Apr. 18	124	1893, Dec. 9	1894, Apr. 24	137
1858, Nov. 30	1859, Apr. 30	152	1894, Nov. 30	1895, Apr. 21	143
1859, Dec. 8	1860, Apr. 23	138	1895, Dec. 9	1896, Apr. 22	136
1860, Dec. 7	1861, Apr. 25	140	1896, Dec. 18	1897, Apr. 24	128
1861, Dec. 23	1862, May 6	135	1897, Dec. 4	1898, Apr. 16	134
1862, Dec. 9	1863, May 2	145	1898, Dec. 14	1899, Apr. 29	137
1863, Dec. 21	1864, Apr. 23	125	1899, Dec. 27	1900, Apr. 24	119
1864, Dec. 13	1865, Apr. 13	122	1900, Dec. 11	1901, Apr. 20	131
1865, Dec. 16	1866, Apr. 18	124	1901, Dec. 19	1902, Apr. 2	105
1866, Dec. 16	1867, Apr. 27	133	1902, Dec. 8	1903, Apr. 5	119
1867, Dec. 2	1868, May 1	152	1903, Dec. 15	1904, Apr. 28	136
1868, Dec. 4	1869, Apr. 29	147	1904, Dec. 3	1905, Apr. 21	140
1869, Dec. 9	1870, Apr. 24	137	1905, Dec. 8	1906, Apr. 24	138
1870, Dec. 15	1871, Apr. 9	116	1906, Dec. 5	1907, May 1	148
1871 Dec. 7	1872, May 3	149	1907, Dec. 19	1908, Apr. 21	125
1872, Dec. 9	1873, May 2	145	1908, Dec. 8	1909, Apr. 20	134
1873, Nov. 27	1874, May 4	159	1909, Dec. 25	1910, Apr. 4	101
1874, Dec. 10	1875, May 2	144	1910, Dec. 9	1911, Apr. 28	141

NOTE.—Average length of time closed, 135 days per year. Greatest length of time closed, 173 days, Nov. 2, 1843, to Apr. 22, 1844. Shortest length of time closed, 101 days, Dec. 25, 1909, to Apr. 4, 1910. Earliest date closed, Nov. 2, 1843. Latest date closed, Jan. 9, 1890. Earliest date opened, Apr. 2, 1902. Latest date opened, May 9, 1888.

COBBOSSEECONTEE STREAM AT GARDINER, MAINE.

Cobbosseecontee Stream drains a group of lakes lying 5 to 15 miles west of Augusta. From the largest of these, Cobbosseecontee Pond, which has an area of 8.4 square miles, the river flows southward, eastward, and then northeastward, entering Kennebec River at Gardiner. Its total drainage area, 240 square miles, is largely in farm lands. The aggregate area of the ponds at the head of the

stream is about 19 square miles. From Lake Maranacook—one of the upper lakes—to the Kennebec the fall is 206 feet, about 128 feet in the last three-fourths of a mile of the river course.

The Cobbosseecontee is a most remarkable example of the regularity of flow that can be obtained with proper storage, and except for a short time each spring there is usually no water wasted.

Records of flow of Cobbosseecontee Stream have been kept at the dam of the Gardiner Water Power Co. since 1890. This dam is the uppermost of a series of seven dams near the mouth of the river at Gardiner, and is of stone masonry, with a timber apron at the toe. The downstream face has an approximate slope of 1 horizontal to 4 vertical. The crest is horizontal and is about 6 feet wide. The upstream slope is about 1 vertical to 8 horizontal. The total length of the dam is about 100 feet, and flashboards 4.5 feet high are maintained continuously. The total head obtained is about 10 feet. The head-bay entrance is on the right bank, and from this runs a wooden penstock in which is placed a 39-inch Hercules wheel. In the head bay there is also a gatehouse with two gates which are kept partially open most of the time to regulate the proper flow down the river.

The records of flow are made up by considering (1) the flow over the dam, which is usually nothing, except for a short time in the spring; (2) the flow through the sluice gates, which is regulated by means of tables drawn up for the company by Hiram F. Mills, C. E., showing the discharge through the two gates for different pond levels, the practical application of this method being to obtain a given flow at any time by setting these gates at the required gate opening, the flow through the wheel being taken into account; (3) the amount of water flowing through the 39-inch wheel, which is ascertained from this gate opening and pond level by means of a table, also provided for this purpose by Mr. Mills. The water that is pumped for the Gardiner supply is neglected in computations, being but a small percentage of the flow. It is also assumed that the tail-water level remains constant. The leakage by the dam was measured during 1905 and found to be 10 second-feet, and correction made accordingly until August, 1907, when the dam was repaired. On Sundays and legal holidays gates are closed and no water is allowed to run unless the lake is full.

These records have been furnished by S. D. Warren & Co., through their engineer, Joseph A. Warren, and are considered excellent.

The maximum daily discharge since the establishment occurred March 12, 1903, and was 3,275 second-feet. The discharge for the minimum week (not including holidays or times when for some reason the plant was shut down) occurred October 23 to 29, 1899, and averaged 57 second-feet.

Data prior to 1907 have been compiled in Water-Supply Paper 198. Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of Cobbosseecontee Stream at Gardiner, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	230	240	280	336	[a] 860	280	280	260	260	260	220	150
2	[a] 0	240	280	345	875	280	280	260	260	[a] 0	220	150
3	230	240	280	[a] 354	875	280	[a] 0	260	260	260	220	150
4	230	240	280	345	850	280	20	260	[a] 0	260	220	[a] 0
5	230	240	280	325	850	[a] 0	160	260	260	260	220	150
6	230	[a] 0	[a] 0	310	875	280	280	260	260	260	[a] 0	150
7	230	240	290	306	875	280	170	[a] 0	260	260	220	150
8	230	240	350	306	[a] 370	280	260	260	260	260	220	150
9	[a] 0	240	400	315	290	280	260	260	260	[a] 0	220	150
10	215	240	390	[a] 0	280	280	[a] 0	260	260	220	220	150
11	200	240	370	280	280	280	260	260	[a] 0	220	220	[a] 0
12	200	240	335	280	280	[a] 0	260	260	260	220	220	140
13	200	[a] 0	[a] 15	280	280	280	260	260	260	220	[a] 0	130
14	200	240	314	280	280	280	260	[a] 0	260	220	200	120
15	200	240	314	280	[a] 0	280	260	260	260	220	200	120
16	[a] 0	240	314	280	280	280	260	260	260	[a] 0	200	120
17	200	240	314	[a] 0	280	280	[a] 0	260	260	220	200	120
18	200	240	305	270	280	280	260	260	[a] 0	220	200	[a] 0
19	200	240	300	260	280	[a] 0	260	260	260	220	200	120
20	200	[a] 0	[a] 0	260	280	280	260	260	260	220	[a] 0	120
21	200	240	280	260	280	280	260	[a] 0	260	220	170	120
22	215	240	280	260	[a] 0	280	260	260	260	220	170	120
23	[a] 0	240	280	270	280	280	260	260	260	[a] 0	170	110
24	260	240	280	[a] 0	280	280	[a] 0	260	260	220	85	100
25	245	240	280	280	280	280	260	260	[a] 0	220	170	[a] 0
26	230	240	290	280	280	[a] 0	260	260	260	220	170	30
27	230	[a] 0	[a] 160	285	280	280	260	260	260	220	[a] 0	120
28	230	270	320	445	280	280	260	[a] 0	260	220	150	120
29	230	.....	320	580	[a] 0	280	260	260	260	220	150	120
30	[a] 0	.....	325	708	20	280	260	260	260	[a] 0	150	125
31	240	.....	336	.....	280	.....	[a] 0	260	.....	220	.....	130

[a] Sunday.

Monthly discharge of Cobbosseecontee Stream at Gardiner, Maine, for 1910.

[Drainage area, 240 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	260	0	184	0.767	0.88
February	270	0	207	.862	.90
March	400	0	276	1.15	1.33
April	708	0	293	1.22	1.36
May	875	0	380	1.58	1.82
June	280	0	243	1.01	1.13
July	280	0	206	.858	.99
August	260	0	226	.942	1.09
September	260	0	225	.938	1.05
October	260	0	194	.808	.93
November	220	0	167	.696	.78
December	150	0	111	.462	.53
The year	875	0	226	.942	12.79

ANDROSCOGGIN RIVER.

GENERAL FEATURES OF AREA DRAINED.

Androscoggin River is formed by the junction of Magalloway River and the outlet of the Umbagog-Rangeley Lakes near the Maine-New Hampshire boundary. For about 35 miles it flows southward in New Hampshire, then turns abrubtly and flows eastward in Maine, finally turning toward the south and joining the Kennebec in Merrymeeting Bay, near Brunswick. The river is about 200 miles long and the greatest width of its basin about 70 miles. The total drainage area is 3,470 square miles, about 80 per cent of which is in Maine. Its only important tributary is Little Androscoggin River, which enters at Auburn.

The lower part of the basin is hilly and partly wooded, and much of it is farm land; the upper part is very broken and mountainous and is largely in forest. The general elevation of the basin is greater than that of any other on the Atlantic coast. Umbagog Lake is about 1,240 feet above sea level, and Rangeley Lake about 1,500 feet. The sources of Magalloway River reach elevations of from 2,600 to 2,900 feet.

Granite, gneiss, and mica schists are found along the main course of the river, with clay slate in the upper part of the basin. The bed of the river, like that of the Kennebec and Penobscot, is rocky where falls occur, and its high banks little subject to overflow—conditions that are advantageous in the development of water power.

The mean annual precipitation is probably about 40 inches, ranging from 43 inches near the coast to less than 35 inches in the extreme northern part of the basin. Winters in the northern portions of the basin are extremely rigorous and low water frequently occurs during the winter months on this account.

The Androscoggin is naturally provided with storage facilities as fine as those of any other river in the East. Including the Umbagog-Rangeley series and Kennebago Lake, which afford a combined water surface of about 69 square miles, there is a storage of about 19,600,000,000 cubic feet. The drainage area at the outlet of Umbagog Lake and above the mouth of Magalloway River is 635 square miles; of Magalloway River at its mouth, 460 square miles. Under the efficient management of the Union Water Power Co. the storage afforded by these lakes has had a marked effect upon the regimen of flow during low water for the past few years. A number of the companies on the river have formed the Androscoggin Reservoir Co. and constructed a dam on Magalloway River which affords approximately 8,000,000,000 cubic feet of additional storage and very materially increases the low-water flow of the Androscoggin.

Androscoggin River is probably as well developed as any other river in the country. Of the 1,240 feet fall between Umbagog Lake and

tide water about 659 feet have been developed and furnishes power to many mills, including the cotton mills of Brunswick and Lewiston, and the great pulp and paper mills of Livermore Falls, Rumford Falls, and Berlin; but there still remain some excellent unutilized sites of especial value on account of the uniform flow of the stream.

Androscoggin River is an important stream for log driving, and care is exercised in the amount of water used for this purpose. The regulation of the flow is under one management, and is controlled in the interests of both log driving and the water-power developments.

Little Androscoggin River, about 30 miles long and draining an area of about 380 square miles, is well endowed with storage facilities and is an important water-power stream for its size. The river is practically all utilized from Mechanic Falls to the mouth at Auburn.

The longest record of flow on the Androscoggin is that at Rumford Falls, extending back to 1892. The driest year since the beginning of the records was 1905, and the wettest 1893, the total flow during these two years being about in the ratio of 1 to 1.89.

RIVER SURVEYS IN ANDROSCOGGIN RIVER BASIN.

The results of surveys in the Androscoggin River basin by the United States Geological Survey in cooperation with the State of Maine are represented by the maps in the following list:

	Sheets.
Androscoggin River, Brunswick to Livermore Falls, profile only	2
Androscoggin River, Livermore Falls to Umbagog Lake, plan and profile	8
Umbagog Lake, Upper Richardson Lake, Lower Richardson Lake	1
Mooselookmeguntic Lake	1
Mooselookmeguntic Lake outlet, Richardson Lakes outlet	1

The river maps show not only the plan of the river, with 5-foot contours along the banks, but also the profiles of the rivers, and are of value in studying developed and undeveloped water-power sites, as, in connection with the stream gaging record, they afford data for a close estimate of the total horsepower that can be developed at the rips and falls. The lake maps are of value in computing the capacity of the various lakes in cubic feet if their use as storage reservoirs is contemplated.

These maps may be obtained without cost by applying to C. C. Babb, district engineer, United States Geological Survey, State House, Augusta, Maine.

RANGELEY LAKE, MAINE.

Rangeley Lake, the uppermost of a series of natural storage reservoirs at the headwaters of the Androscoggin River, drains into Mooselookmeguntic Lake through Rangeley Stream. It is located

in the town of Rangeley, Rangeley Plantation, and Sandy River Plantation in Franklin County. The elevation of the lake is 1,515 feet above mean sea level. A dam at the outlet controls a storage of about 1,055,000,000 cubic feet. The storage on this lake, together with that on Mooselookmeguntic, Upper and Lower Richardson, and Umbagog lakes, aggregating 18,500,000,000 cubic feet, is regulated in the interests of the numerous and extensive water-power plants below.

The following table shows the dates of closing and opening or disappearance of ice from this lake since 1880, from records furnished by George M. Esty, Rangeley, Maine, to the Commissioners of Inland Fisheries and Game:

Dates of closing and opening of Rangeley Lake.

Closed.	Opened.	Days closed.	Closed.	Opened.	Days closed.
1879, no record	1880, May 8		1895, Dec. 9	1896, May 9	153
1880, no record	1881, May 15		1896, no record	1897, May 12	
1881, no record	1882, May 21		1897, Dec. 19	1898, May 6	139
1882, Dec. 10	1883, May 14	156	1898, Dec. 12	1899, May 7	147
1883, no record	1884, May 11		1899, Dec. 27	1900, May 15	140
1884, Dec. 19	1885, May 16	149	1900, Dec. 11	1901, May 4	145
1885, no record	1886, May 5		1901, Dec. 17	1902, Apr. 28	133
1886, Dec. 5	1887, May 20	167	1902, Dec. 10	1903, Apr. 29	141
1887, Dec. 24	1888, May 23	152	1903, Dec. 12	1904, May 13	154
1888, Dec. 13	1889, Apr. 29	138	1904, Dec. 7	1905, May 2	147
1889, no record	1890, May 9		1905, Dec. 11	1906, May 13	154
1890, Dec. 2	1891, May 14	164	1906, Dec. 9	1907, May 19	162
1891, Dec. 17	1892, May 9	145	1907, Dec. 16	1908, May 10	147
1892, no record	1893, May 21		1908, Dec. 8	1909, May 14	158
1893, Dec. 4	1894, May 2	150	1909, Dec. 25	1910, Apr. 19	116
1894, Dec. 10	1895, May 7	149	1910, Dec. 11	1911, May 11	152

NOTE.—Earliest closing date, Dec. 2, 1890. Earliest opening date, Apr. 19, 1910. Latest closing date, Dec. 27, 1899. Latest opening date, May 23, 1888. Shortest period closed, 116 days in 1909–10. Longest period closed, 167 days in 1886–7.

ANDROSCOGGIN RIVER AT ERROL DAM, N. H.

The Errol dam controls the storage of Umbagog, the lower of the Rangeley series of lakes. The dam is located about 5 miles below the outlet of the lake, about 3.5 miles below the mouth of Magalloway River, thus making this latter stream one of the feeders of Umbagog Lake, and 1 mile above the town of Errol.

Records of the discharge through the Errol dam have been maintained since January 1, 1905, by the Union Water Power Co. The following records have been furnished by Walter H. Sawyer:

The dam is a frame structure about 175 feet between abutments.

The rod gage is movable. Readings are taken each day from the sill of deep gate No. 6. The entire flow passes through various gates of different sizes, 14 in all. There is no provision for overflow besides the gates. Beginning at the left end, the gates are described as follows:

One gate 10 feet deep by 15 feet wide; seldom used.

Three gates 10½ feet deep by 15 feet wide; open nearly all the time. These three gates were originally the same depth as the one just

mentioned, but a 6-inch plank was removed from that gate a short time ago, as it interfered with the driving of logs.

Nine gates 15 feet deep by 7 feet wide in the clear (so-called deep gates); open a portion of the time only.

One gate 15 feet deep by 5 feet wide; grist-mill gate; used occasionally.

The cap of all the 14 gates is one continuous beam and on the same level, thus making the bottom of the various gates at different levels.

The elevation of the sill of deep gate No. 6 and of the zero of the Errol dam gage is 1,231.3 feet above sea level. A "deadhead" a short distance above the dam at present controls the low-water flow, and its height, 2.66 feet, must be subtracted from the head as read from Errol dam gage to obtain the depth of water in Umbagog available for storage.

The winter flow is only slightly affected by ice at this station.

The gates of the Errol dam have not been rated as thoroughly as might be desired, but the records as published below approximate the true discharge.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of Androscoggin River at Errol dam, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,207	1,122	787	1,393	3,600	3,860	1,307	1,062	1,136	1,108	995	1,183
2	1,184	1,075	738	2,289	3,151	4,336	1,385	1,100	1,122	1,049	1,082	1,160
3	1,150	1,149	755	2,928	2,762	3,784	1,497	1,100	1,180	1,019	879	1,082
4	1,150	1,165	945	3,022	2,339	3,368	1,609	1,116	1,252	1,019	753	1,082
5	1,150	1,085	1,098	3,086	2,887	3,338	1,462	1,155	1,403	978	774	1,168
6	1,150	1,140	964	3,598	3,046	3,268	1,368	1,143	1,592	982	768	1,190
7	1,150	1,190	872	5,873	3,046	3,222	1,264	1,140	1,365	982	515	1,190
8	1,150	1,274	878	6,562	3,010	3,285	1,141	1,188	1,365	967	325	1,190
9	1,150	1,268	1,012	6,844	2,994	3,362	1,154	1,200	1,133	959	931	1,211
10	1,150	1,263	1,219	6,283	2,994	3,261	1,300	1,214	1,098	945	1,145	1,211
11	1,150	1,257	1,212	5,362	2,356	3,261	1,411	1,119	1,098	945	1,070	1,211
12	1,150	1,251	1,212	3,234	1,980	3,243	1,392	1,040	1,219	945	1,062	1,214
13	1,136	1,247	1,198	3,637	2,234	3,200	1,189	1,123	1,168	945	1,048	1,231
14	1,150	1,242	1,198	2,758	2,766	2,853	1,208	1,185	1,146	959	1,038	1,231
15	1,150	1,232	1,202	2,317	2,766	2,596	1,241	1,042	1,129	959	1,023	1,253
16	1,136	1,223	1,199	1,882	2,737	2,556	1,227	972	1,107	959	1,005	1,253
17	1,136	1,138	1,294	2,066	2,528	2,697	1,248	987	1,086	959	990	1,268
18	1,136	1,082	1,324	1,952	1,587	2,185	1,271	1,010	1,123	959	1,112	1,288
19	1,136	1,182	1,316	2,367	1,587	2,264	1,271	1,010	1,044	959	1,199	1,297
20	1,136	1,226	1,304	2,052	1,737	2,461	1,254	979	1,044	978	1,173	1,298
21	1,127	1,218	1,289	2,095	1,769	2,416	1,223	972	1,044	966	1,189	1,270
22	982	1,214	1,289	2,491	2,506	2,358	1,164	1,105	1,169	948	1,215	1,307
23	914	1,207	1,285	2,987	2,700	2,267	1,103	1,180	1,189	959	1,248	1,343
24	989	1,197	1,277	3,049	2,726	2,184	1,039	1,157	1,212	962	1,319	990
25	997	1,187	1,271	3,075	2,752	2,111	933	1,135	1,212	964	1,227	928
26	1,041	1,175	1,236	3,716	3,379	1,981	884	1,104	1,228	1,015	1,190	1,218
27	1,117	1,169	1,175	4,528	3,955	1,900	979	1,153	1,271	999	1,166	1,240
28	1,124	1,055	1,211	2,575	3,989	2,012	1,076	1,267	1,123	1,015	1,141	1,146
29	1,138	.....	1,236	3,842	3,924	1,723	1,031	1,309	1,065	1,015	1,143	1,186
30	1,151	.....	1,288	3,842	3,587	1,338	1,006	1,232	1,108	1,015	1,195	1,074
31	1,162	.....	1,360	.....	3,467	.....	1,019	1,154	.....	937	.....	1,074

Monthly discharge of Androscoggin River at Errol dam, N. H., for 1910.

[Drainage area, 1,095 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	1,207	914	1,121	1.02	1.18
February	1,274	1,055	1,187	1.08	1.12
March	1,360	738	1,150	1.05	1.21
April	6,844	1,393	3,390	3.10	3.46
May	3,989	1,587	2,802	2.56	2.95
June	4,336	1,338	2,756	2.52	2.81
July	1,609	884	1,215	1.11	1.28
August	1,309	972	1,118	1.02	1.18
September	1,592	1,044	1,181	1.08	1.20
October	1,108	937	980	.895	1.03
November	1,319	325	1,031	.942	1.05
December	1,343	928	1,193	1.09	1.26
The year	6,844	325	1,590	1.46	19.73

ANDROSCOGGIN RIVER AT SHELBURNE, N. H.

This station, which is located at the steel highway bridge about half a mile north of railway station at Shelburne, N. H., 5¾ miles below the mouth of Peabody River, and 6 miles above Wild River, was established May 30, 1903, discontinued April 30, 1907, and reestablished May 20, 1910.

A standard chain gage is attached to the bridge; its datum has remained unchanged during the maintenance of the station.

The bed of the river is sandy, and extreme floods and serious obstructions by ice or logs cause considerable changes. Both banks are subject to overflow in extreme high freshets.

Discharge measurements are made from the highway bridge, to which gage is attached.

The nearest dam upstream is that of the Lead-Mine Bridge power station of the Berlin Mills Co., about 2 miles distant. Downstream the first dam is at Rumford Falls. The discharge is affected by log jams and, during the winter months, by ice. At low stages conditions are poor for measuring and the results are approximate.

Estimates of daily discharge for this station are not published for 1910, as the measurements made during this year indicate a change in the control and the data obtained are not adequate for the construction of a discharge rating curve.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of Androscoggin River at Shelburne, N. H., in 1910.

	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 20	F. E. Pressey	394	1,030	4.42	2,930
July 13	do	392	793	3.85	1,660
14	W. E. Parsons	392	830	3.98	1,710
Aug. 24	do	388	851	3.84	1,660

Daily gage height, in feet, of Androscoggin River at Shelburne, N. H., for 1910.

[James Simpson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1						5.82	4.12	4.05	4.00	4.00	4.00	3.65
2						5.82	4.02	4.00	3.95	3.90	4.10	3.60
3						5.80	4.02	4.05	4.02	4.10	4.10	3.70
4						5.82	4.07	4.15	4.00	4.00	4.10	3.65
5						5.67	3.94	4.10	3.95	4.10	4.10	3.70
6						5.57	3.82	4.05	4.20	4.00	3.90	3.75
7						5.37	3.77	3.90	4.15	4.00	4.00	3.75
8						5.27	3.92	3.95	4.10	4.00	4.10	3.80
9						5.02	3.87	3.95	4.05	3.95	3.75	3.85
10						4.97	3.17	3.90	4.10	4.00	4.00	4.15
11						4.92	3.47	4.00	3.95	4.00	4.10	4.65
12						4.97	4.02	3.95	4.05	3.95	4.15	5.30
13						5.02	3.92	4.00	4.00	4.00	4.00	5.20
14						5.02	3.92	3.85	4.10	4.00	4.05	5.20
15						4.92	3.97	4.05	4.00	4.00	4.00	5.95
16						4.90	4.05	4.00	4.00	3.90	4.00	6.15
17						4.82	4.00	4.05	4.00	4.00	.....	.....
18						4.80	4.10	4.00	3.90	4.00	.....	6.30
19						4.80	4.15	4.05	4.05	3.95	4.00	.....
20					4.42	4.97	4.10	4.00	4.00	4.00	3.85	.....
21					4.52	4.77	4.00	3.80	4.10	4.00	4.00	.....
22					3.87	4.62	4.00	4.05	4.05	4.00	4.10	.....
23					4.42	4.62	4.05	4.00	4.10	3.85	4.00	.....
24					4.52	4.54	3.90	4.00	4.05	4.00	3.90	.....
25					4.62	4.57	4.15	4.05	4.00	4.00	3.85	6.50
26					4.97	4.62	4.05	4.00	4.00	4.00	3.80	.....
27					5.60	4.57	4.10	4.05	4.05	4.00	3.70	.....
28					5.72	4.37	5.60	3.90	4.00	4.00	3.75	.....
29					5.70	4.27	4.20	4.05	4.10	4.00	3.80	.....
30					5.74	4.12	4.10	3.95	4.00	3.90	3.80	.....
31					5.80	.....	3.45	4.00	.....	4.00	.....	.....

NOTE.—Backwater caused by ice below the station from Dec. 10 to 25. Gage heights taken to water surface. The relation between gage height and discharge may also have been slightly affected by ice during the first part of December.

ANDROSCOGGIN RIVER AT RUMFORD FALLS, MAINE.

The discharge of Androscoggin River at Rumford Falls since 1892 has been computed and furnished by Charles A. Mixer, engineer for the Rumford Falls Power Co., by adding the actual measured quantities passing through the wheels to the computed flow over the dam, using the customary Francis weir formula with modified coefficient.

At Rumford Falls is one of the finest water powers on the Atlantic coast. Here the Androscoggin descends 177 feet in a mile in several pitches over granite ledges. A comprehensive plan of development for the use of power from three levels has been laid out and

partly executed. From the high-level canal there is a fall of 97 feet to the middle level, which also receives a direct and independent supply of water from the river. The water in the middle-level canal is then used and discharged, after a fall of 50 feet, into the low-level canal, from which, in turn, there is a final drop of 30 feet to the river. Dams have been built at the entrance of the high and middle level canals.

The present wheel installation calls for 30,000 horsepower, of which 25,000 horsepower are utilized at Rumford Falls, largely in the manufacture of pulp and paper. The total proposed development comprises some 54,000 gross horsepower.

The maximum daily discharge occurred April 15, 1895, and was about 55,200 second-feet. The discharge for the minimum week occurred February 15 to 21, 1904, and averaged 686 second-feet.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of Androscoggin River at Rumford Falls, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,389	2,298	3,740	10,577	[a]8,034	4,907	2,094	1,348	1,691	1,600	1,600	1,534
2	[a]1,531	2,215	3,698	9,788	6,581	5,225	1,956	1,486	1,541	[a]1,526	1,503	1,445
3	1,545	2,247	3,309	[a]9,230	6,058	5,033	[a]1,940	1,308	1,530	1,452	1,518	1,226
4	1,495	2,154	3,051	8,289	6,864	4,811	1,940	2,019	[a]1,646	1,460	1,738	[a]1,208
5	1,340	2,235	2,863	8,924	6,540	[a]4,506	1,924	3,445	1,646	1,500	2,425	1,293
6	1,401	[a]1,980	[a]2,696	11,790	5,484	4,103	1,866	2,382	1,762	1,490	[a]2,222	1,567
7	1,553	1,737	2,780	12,796	4,820	4,780	1,817	[a]2,092	2,094	1,655	2,018	1,116
8	1,536	1,756	2,800	12,736	[a]4,671	4,416	1,751	1,802	1,949	1,663	2,006	1,260
9	[a]1,575	1,832	2,715	11,554	4,664	4,172	1,681	1,821	2,005	[a]1,485	1,516	1,307
10	1,491	1,896	2,555	[a]10,596	4,643	3,959	[a]1,847	1,592	1,888	1,306	1,463	1,212
11	1,515	2,042	2,407	9,233	4,694	3,836	1,822	1,695	[a]1,664	1,400	1,695	[a]1,265
12	1,503	1,941	2,458	7,240	4,204	[a]4,374	1,898	1,732	1,440	1,626	1,783	1,319
13	1,526	[a]1,882	[a]2,512	5,951	3,524	4,409	1,732	1,676	1,738	1,492	[a]1,530	1,468
14	1,541	1,888	2,567	5,053	3,434	3,765	1,549	[a]1,608	1,748	1,338	1,506	1,316
15	1,478	1,922	2,624	4,355	[a]3,207	3,579	1,685	1,539	1,970	1,335	1,673	1,475
16	[a]1,430	1,914	2,360	4,501	3,810	3,430	1,579	2,281	1,887	[a]1,248	1,565	1,409
17	1,490	1,898	2,444	[a]3,781	3,865	3,533	[a]1,572	2,212	1,842	1,162	1,535	1,292
18	1,557	1,879	2,199	3,710	3,462	3,707	1,449	2,054	[a]1,732	1,355	1,749	[a]1,540
19	1,551	1,831	2,224	4,564	3,551	[a]4,050	1,654	1,920	1,622	1,169	1,664	1,412
20	1,608	[a]1,750	[a]2,315	6,702	3,144	3,515	1,556	1,775	1,556	1,389	[a]1,526	1,526
21	1,622	1,818	2,406	7,265	3,120	3,227	1,525	[a]1,694	1,439	1,661	1,388	1,581
22	8,264	1,978	2,842	7,828	[a]2,562	3,106	1,534	1,613	1,448	1,442	1,517	1,446
23	[a]14,223	2,107	2,942	11,244	3,211	2,779	1,619	1,545	1,470	[a]1,379	1,546	1,332
24	7,625	2,034	3,082	[a]8,393	3,416	2,776	[a]1,591	1,493	1,627	1,316	1,438	1,433
25	4,561	1,938	5,494	7,008	3,493	2,754	1,384	1,631	[a]1,490	1,472	1,445	[a]1,904
26	3,713	1,862	9,063	8,964	3,768	[a]2,185	1,514	1,627	1,352	1,407	1,428	1,654
27	3,056	[a]1,822	[a]7,587	14,253	4,327	2,428	1,384	1,552	1,446	1,408	[a]1,528	1,434
28	2,882	2,168	6,353	10,839	4,559	2,500	1,417	[a]1,471	1,580	1,562	1,689	1,738
29	2,599	.....	6,842	7,879	[a]4,487	2,057	2,042	1,390	1,812	1,579	1,556	1,687
30	[a]2,470	.....	10,312	7,479	4,328	2,242	1,381	1,488	1,677	[a]1,490	1,608	1,662
31	2,282	.....	10,370	.....	4,474	.....	[a]1,301	1,587	.....	1,500	.....	1,460

[a] Sunday.

Monthly discharge of Androscoggin River at Rumford Falls, Maine, for 1910.

[Drainage area, 2,090 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	14,223	1,340	2,669	1.28	1.48
February	2,298	1,737	1,965	.940	.98
March	10,370	2,199	3,923	1.88	2.17
April	14,253	3,710	8,417	4.03	4.50
May	8,034	3,120	4,419	2.11	2.43
June	5,225	2,057	3,672	1.76	1.96
July	2,094	1,301	1,678	.803	.93
August	3,445	1,308	1,770	.847	.98
September	2,094	1,352	1,676	.802	.90
October	1,663	1,162	1,447	.692	.80
November	2,425	1,388	1,646	.788	.88
December	1,904	1,116	1,436	.687	.79
The year	14,253	1,116	2,893	1.38	18.80

LAKE AUBURN, MAINE.

Lake Auburn is in the city of Auburn in Androscoggin County. The outlet stream is about 2 miles long and enters Androscoggin River about 2 miles above the mouth of the Little Androscoggin River. The lake is used for the water supply of the cities of Lewiston and Auburn. The area of the lake is 3.5 square miles at an elevation of 259 feet above mean sea level.

The following table gives the dates of opening or disappearance of ice from this lake:

Dates of opening of Lake Auburn, Maine.

1890, Apr. 26.	1898, Apr. 18.	1906, Apr. 24.
1891, Apr. 27.	1899, Apr. 30.	1907, Apr. 30.
1892, Apr. 21.	1900, Apr. 26.	1908, Apr. 24.
1893, May 5.	1901, Apr. 15.	1909, Apr. 30.
1894, Apr. 24.	1902, Apr. 4.	1910, Apr. 5.
1895, Apr. 23.	1903, Apr. 4.	1911, Apr. 29.
1896, Apr. 25.	1904, May 1.	
1897, Apr. 26.	1905, Apr. 23.	

PRESUMPSCOT RIVER.

GENERAL FEATURES OF AREA DRAINED.

Presumpscot River, the outlet of Sebago Lake, rises about 17 miles northwest of Portland. The principal tributary of the lake is Crooked River, a stream heading 35 miles farther north and within 3 miles of the Androscoggin. The area of the lake is 44.8 square miles. The total lake surface in the drainage basin is 78 square miles. The area of the drainage basin at the outlet of the lake is 436 square miles, and at the mouth of the river 616 square miles.

The northern part of the basin is mountainous and wooded; the southern part is moderately hilly and mostly in farm land. Granite gneiss and mica schists appear in many places, and the soil is gravelly and sandy. The fall from Sebago Lake to tidewater is about 265 feet in a distance of nearly 22 miles, or an average of about 12 feet per mile.

The mean annual precipitation is probably about 42 inches. The river and lake generally freeze over during the winter.

Sebago Lake is a magnificent natural storage reservoir, and its utilization for this purpose has made the regimen of flow of the Presumpscot extremely regular. Nowhere in the United States is there a better example of efficient regulation of storage than on the Presumpscot.

A record of flow from Sebago Lake has been kept since 1887. During this period of over 20 years the driest season was that of 1905 and the wettest 1891, the total flow for these two years being about in the ratio of 1 to 2.22.

SEBAGO LAKE, MAINE.

Sebago Lake lies in Cumberland County, in the towns of Sebago, Naples, Casco, Raymond, and Standish, at an altitude of 262 feet above sea level. Its maximum length (northwest-southeast) is about 12 miles; its greatest width (across the north end) 5 miles, and the area of its water surface 44.8 square miles. Its principal tributaries drain many lakes and ponds lying to the north and west. On the southwest the divide separating its waters from those of Saco River lies scarcely a mile back from the lake shore. The lake contains a number of islands, of which Frye Island is the largest.

The flow of the lake to Presumpscot River is controlled by the dam at North Windham.

Record of the annual date of opening of the lake has been kept for more than a century. A record of the closing dates has not been kept.

The lower bay usually closes from December 18 to January 7, on the average about December 25. The great bay usually closes about the middle of January. The following is the record of opening or disappearance of ice from the lake:

Dates of opening of Sebago Lake.

1807, May 7.	1823, Apr. 23.	1843, May 2.
1812, May 1.	1824, Apr. 17.	1844, Apr. 17.
1816, Apr. 30.	1825, Apr. 16.	1845, Apr. 24.
1819, Apr. 29.	1826, Apr. 18.	1846, Apr. 14.
1820, Apr. 25.	1834, Apr. 14.	1849, Apr. 29.
1821, Apr. 29.	1837, May 1.	1852, May 4.
1822, Apr. 12.	1841, Apr. 29.	1855, Apr. 27.

1857, Apr. 14.
1858, Apr. 16.
1862, Apr. 29.
1863, Apr. 28.
1866, Apr. 18.
1867, Apr. 26.
1871, Apr. 5.
1872, May 9.
1873, May 1.
1874, May 7.
1875, May 6.
1876, May 1.
1877, Apr. 23.
1878, Apr. 12.
1879, May 5.
1880, Apr. 13.
1881, Apr. 24.
1882, Apr. 19.
1883, Apr. 29.
1884, Apr. 26.
1885, Apr. 26.
1886, Apr. 25.
1887, May 1.
1888, May 8.
1889, Apr. 12.
1890, Apr. 24.
1891, Apr. 23.
1892, Apr. 23.
1893, May 4.
1894, Apr. 19.
1895, Apr. 21.
1896, Apr. 21.
1897, Apr. 22.
1898, Apr. 13.
1899, Apr. 27.
1900, Apr. 26.
1901, Apr. 15.
1902, Mar. 29.
1903, Mar. 27.
1904, Apr. 23.
1905, Apr. 24.
1906, Apr. 21.
1907, Apr. 25.
1908, Apr. 25.
1909, Apr. 8.
1910, Apr. 1.
1911, Apr. 20.

PRESUMPSCOT RIVER AT OUTLET OF SEBAGO LAKE, MAINE.

Since January, 1887, the flow from Sebago Lake has been regularly recorded, the quantity being deduced during most of this time from the openings in the gates at the dam, the discharging capacity of which under different conditions of head has been determined and tabulated by Hiram F. Mills, of Lowell. In March, 1904, S. D. Warren & Co. completed a hydroelectric plant at Eel Weir Falls, near Sebago Lake, bringing water directly from the dam at the lake by means of a canal. A head of 40 feet is thus obtained at average lake level.

The development of Eel weir has necessitated a different method of recording the flow from the lake. The water is used through three pairs of 33-inch Hercules wheels. The water used by these wheels is recorded by three Allen meters, one on each pair. These meters were rated by the result of a test at Holyoke of one pair of these wheels.

Since the station was finished the performance of the wheels and of the recording meters has been checked by careful current-meter readings in the canal and brake tests of the wheels, combined with electrical readings of the generator output. The records of the generator output of the station are kept and the constant ratio between these readings and the Allen meter records gives a good check on the latter.

It is usually desired to keep a constant flow through the canal, and when demands for power are not sufficient to utilize the entire flow through the wheels the excess of water is run off through a pair of regulating gates at the power station, a record of the openings of these gates being kept and the flow computed from a coefficient determined by current-meter tests.

The flow at times from the lake may be greater than it is safe to carry through the canal, though this has not yet happened. At

such times it will be necessary to draw part of the water through the old regulating gates in the main dam.

A continuous record of the Sebago Lake level has been kept since January, 1872. The lake fills rapidly after March 1, attaining its maximum height between the middle of April and June 1, and then gradually subsides as water is withdrawn for mill purposes until a minimum stage is reached—sometimes in the autumn, but usually in the winter.

The records of lake level and discharge make an unusually complete and valuable series of data. These have been furnished from time to time by S. D. Warren & Co., and the data regarding the new methods of measurement, etc., is from a description furnished by Joseph A. Warren.

The maximum daily discharge occurred March 6, 1896, and was 13,800 second-feet. The discharge for the minimum week (not considering periods when for some reason the plant was not running) occurred March 17 to 23, 1907, and averaged 256 second-feet.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of Presumpscot River at outlet of Sebago Lake, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	678	708	649	543	[a] 364	555	553	552	552	532	530	425
2	[a] 395	690	463	428	550	552	543	555	550	[a] 186	528	413
3	685	678	595	[a] 374	553	555	[a] 258	555	545	537	535	410
4	705	680	563	547	552	550	338	552	[a] 403	537	527	[a] 327
5	700	637	513	543	557	[a] 307	542	548	543	537	525	408
6	707	[a] 395	[a] 278	547	557	553	553	550	547	537	[a] 357	427
7	688	687	475	550	555	552	557	[a] 320	547	538	528	420
8	640	670	435	547	[a] 342	552	553	550	547	523	528	420
9	[a] 378	673	480	563	555	553	553	552	547	[a] 117	528	437
10	697	670	580	[a] 360	553	553	[a] 369	550	533	487	528	422
11	688	665	600	545	552	550	555	553	[a] 317	555	528	[a] 293
12	708	648	587	548	550	[a] 327	560	548	547	538	527	427
13	700	[a] 357	[a] 307	548	550	555	553	545	547	538	[a] 390	427
14	707	680	567	560	548	555	553	[a] 343	542	535	527	425
15	677	707	535	562	[a] 205	554	558	548	545	537	527	433
16	[a] 428	703	538	473	552	552	550	548	537	[a] 377	527	337
17	682	708	533	[a] 367	552	575	[a] 399	548	540	575	527	318
18	690	700	537	547	552	557	552	547	[a] 306	535	525	[a] 125
19	675	695	533	548	555	[a] 413	553	548	543	533	523	343
20	677	[a] 373	[a] 342	550	550	545	553	543	543	533	[a] 295	342
21	673	692	538	550	550	550	557	[a] 315	543	525	422	343
22	427	688	537	507	[a] 301	548	555	548	542	528	442	343
23	[a] 226	705	553	482	552	552	553	548	542	[a] 236	422	338
24	685	700	603	[a] 310	552	548	[a] 263	548	542	615	425	340
25	672	700	562	552	553	548	553	548	[a] 393	535	428	[a] 138
26	670	668	538	543	552	[a] 404	555	547	542	535	428	348
27	688	[a] 400	[a] 350	492	552	545	537	542	540	533	[a] 360	330
28	708	668	535	517	548	545	552	[a] 370	540	532	422	347
29	655	.....	553	552	[a] 310	550	553	543	542	528	427	337
30	[a] 330	.....	532	498	567	550	545	547	537	[a] 410	427	340
31	690	.....	553	.....	523	.....	[a] 335	548	.....	530	.....	322

[a] Sunday.

Monthly discharge of Presumpscot River at outlet of Sebago Lake, Maine, for 1910.

[Drainage area, 436 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	708	226	624	1.43	1.65
February	708	357	641	1.47	1.53
March	649	278	515	1.18	1.36
April	563	310	508	1.17	1.30
May	567	205	512	1.17	1.35
June	575	307	527	1.21	1.35
July	560	258	508	1.17	1.35
August	555	315	521	1.19	1.37
September	552	306	518	1.19	1.33
October	615	117	493	1.13	1.30
November	535	295	474	1.09	1.22
December	437	125	358	.821	.95
The year	708	117	516	1.18	16.06

SACO RIVER.

GENERAL FEATURES OF AREA DRAINED.

Saco River rises in the White Mountain region of New Hampshire at an elevation of about 1,900 feet above sea level and has a general southeasterly course to the Atlantic Ocean. It is about 105 miles long; the maximum width of its drainage basin is about 30 miles, and its drainage area, comprising 1,720 square miles, lies about equally in Maine and New Hampshire. Ossipee River, the largest tributary of the Saco, enters the main stream at Cornish, Me.

The headwaters of the Saco are in one of the highest and roughest mountain regions in the eastern portion of the United States, with steep wooded slopes and narrow river valleys, and with heavy falls to the mountain streams. The mountains grow gradually lower as the ocean is approached, becoming undulating hills in the central portions of the basin and comparatively flat land near the sea. The southern half of the drainage basin has been practically cleared of forests, but the remainder is still largely wooded. The prevailing rock is granite, which makes excellent building material for dams and foundations. The surface material covering the larger part of the region is sand and gravel.

The mean annual precipitation is about 43 inches. Winter conditions in the mountainous part of the basin are quite rigorous and snowfall usually deep.

The Saco River drainage basin has about 84 square miles of lake surface, of which Great Ossipee and Moose lakes are the most important. In its upper courses the river falls very rapidly, but the regimen of flow is variable and typical of the mountain stream. In the lower part of the basin, particularly below the entrance of Ossipee

River, the stream is more stable in regimen. There are some excellent undeveloped power sites on Saco River, and at Biddeford and Saco are the important developments of the Saco Water Power Co., furnishing power for cotton mills. The Saco is rapidly being developed, as its power is adjacent to Portland and other cities where a good market is available.

At West Buxton is the hydroelectric plant of the Portland Electric Co., built in 1906–7 and developing 4,000 horsepower. About 1¾ miles above, at Bonnie Eagle Falls, is the new hydroelectric plant of the Cumberland County Power & Light Co., providing for 8,000 horsepower development and placed in operation in 1911.

SACO RIVER NEAR CENTER CONWAY, N. H.

This station, which is located at the wooden highway bridge between Center Conway and Redstone, N. H., about 2 miles from each place, about 3 miles below the mouth of Swift River, and 2 miles above the outlet of Conway Lake, was established August 26, 1903, in cooperation with the New Hampshire Forestry Commission. Since 1904 it has been maintained by the United States Geological Survey.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station.

Discharge measurements are made from the bridge or by wading.

During the winter months the discharge is so affected by ice that observations are discontinued.

Recent measurements indicate a radical change in conditions of flow. Insufficient measurements have been taken to define the new discharge rating curve.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

The following discharge measurement was made by W. E. Parsons, from the railroad bridge about 900 feet below the station:

August 16, 1910: Width, 120 feet; area, 915 square feet; gage height, 5.19 feet; discharge, 1,360 second-feet.

Daily gage height, in feet, of Saco River near Center Conway, N. H., for 1910.

[Fred Masterton, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.48	.....	7.85	6.12	4.82	3.82	3.32	3.24	3.33	3.36	3.53
2	4.48	4.92	.....	7.94	6.17	4.74	3.70	3.26	3.24	3.34	3.32	3.48
3	.....	5.24	.....	7.22	5.97	4.47	3.70	3.26	3.23	3.37	3.66	3.30
4	.....	7.62	.....	6.86	6.54	4.31	3.69	3.70	3.41	3.38	4.56	3.39
5	.....	7.06	.....	7.38	6.02	4.21	3.73	6.66	3.45	3.37	5.36	3.54
6	.....	6.02	5.97	8.24	5.68	4.55	3.68	4.67	4.02	3.36	4.84	3.53
7	.....	.....	5.28	8.49	5.48	5.35	3.56	4.14	4.56	3.34	4.40	.....
8	.....	.....	5.24	7.55	5.28	5.00	3.54	4.08	3.97	3.33	4.12	.....
9	4.53	.....	5.02	6.70	5.20	4.73	3.51	3.88	3.71	3.34	3.94	.....
10	.....	.....	4.82	6.26	5.34	4.52	3.45	3.72	3.54	3.33	3.87	.....
11	.....	.....	4.58	6.00	5.24	4.61	3.50	3.81	3.48	3.32	3.82	.....
12	.....	.....	4.66	5.74	5.02	5.84	3.56	3.88	3.41	3.28	3.76	.....
13	.....	.....	4.52	5.48	4.92	5.78	3.44	3.71	3.44	3.27	3.74	.....
14	.....	.....	4.70	5.30	4.79	5.17	3.43	3.58	4.00	3.29	3.70	.....
15	.....	.....	4.51	5.28	4.72	4.82	3.42	3.50	3.93	3.30	3.65	.....
16	.....	.....	4.38	4.72	4.68	4.63	3.38	4.98	3.64	3.32	3.60	.....
17	.....	.....	4.36	5.09	4.59	4.69	3.36	4.19	3.52	3.32	3.58	.....
18	.....	.....	4.10	5.08	4.56	5.12	3.33	3.80	3.44	3.28	3.56	.....
19	.....	.....	4.26	5.70	5.46	5.31	3.31	3.73	3.40	3.27	3.55	.....
20	.....	.....	4.36	7.08	5.02	4.79	3.34	3.76	3.37	3.28	3.46	.....
21	.....	.....	4.92	7.42	4.77	4.55	3.32	3.59	3.30	3.26	3.68	.....
22	14.37	.....	4.85	7.50	4.71	4.34	3.52	3.52	3.30	3.26	3.53	.....
23	8.65	.....	5.06	8.61	4.62	4.28	3.60	3.46	3.30	3.28	3.52	.....
24	6.88	.....	5.23	7.13	4.60	4.22	3.45	3.42	3.28	3.32	3.50	.....
25	6.12	.....	6.64	7.17	4.61	4.14	3.38	3.36	3.28	3.32	3.49	.....
26	5.66	.....	8.32	6.80	4.90	4.01	3.32	3.37	3.36	3.32	3.41	.....
27	5.33	.....	6.84	9.54	4.70	3.98	3.30	3.28	3.32	3.30	3.48	.....
28	5.11	.....	6.59	7.62	4.52	3.96	3.26	3.25	3.40	3.35	3.43	.....
29	5.00	.....	6.77	6.69	4.44	3.93	3.29	3.28	3.58	3.54	3.44	.....
30	4.83	.....	8.23	6.50	4.32	3.88	3.24	3.26	3.41	3.48	3.50	.....
31	4.72	.....	8.20	.....	4.38	.....	3.32	3.23	.....	3.40	.....	.....

NOTE.—Ice was present at this station from Jan. 1 to about Mar. 6 and from about Dec. 5 to 31. Gage readings during these periods probably to water surface. The thickness of ice from January to March varied from 1.7 feet to 0.1 foot.

SACO RIVER AT WEST BUXTON, MAINE.

During October, 1907, a hydroelectric plant was completed at West Buxton, Maine, by the Portland Electric Co. Records of flow at this point have been furnished the United States Geological Survey by J. A. Fleet, engineer for the company.

The dam is of concrete, with a rollway about 300 feet long, and a head of about 25 feet is utilized by three 750-kilowatt units. The discharge is based upon gage readings taken every hour and the results are considered excellent.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of Saco River at West Buxton, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	764	2,006	3,772	9,322	a10,790	2,622	1,761	857	763	727	811	875
2	a496	1,685	4,639	10,114	10,298	3,423	1,663	844	673	a 626	721	813
3	939	1,599	4,900	a10,100	9,422	3,253	a 945	566	723	1,032	740	1,008
4	905	1,396	5,020	10,914	9,025	3,429	1,201	658	a 460	1,000	737	a 424
5	841	1,413	5,074	10,203	8,540	a3,049	1,529	1,039	797	818	1,053	842
6	803	a1,019	a4,806	9,969	7,602	3,377	1,576	1,398	1,193	693	a 693	930
7	838	1,381	5,551	9,668	7,012	3,454	1,226	a1,407	774	823	1,694	814
8	879	1,318	6,043	9,421	a 6,837	3,369	1,114	1,872	792	877	1,608	749
9	a 570	1,277	5,698	9,533	6,243	3,449	1,091	1,667	1,046	a 457	1,541	581
10	1,029	1,218	5,500	a 9,331	5,799	3,452	a 857	1,510	1,149	750	1,519	443
11	929	1,073	5,356	9,214	5,323	3,562	856	1,519	a 714	806	1,318	a 208
12	900	1,050	5,159	8,320	4,989	a3,275	995	1,357	1,193	646	1,221	638
13	868	a 810	a4,678	7,597	4,617	4,365	781	1,285	1,212	694	a1,131	799
14	835	1,128	5,218	6,871	4,321	4,108	766	a 896	1,039	667	1,294	654
15	838	1,051	5,142	6,123	a 3,809	4,128	898	1,472	1,239	735	1,458	909
16	a 465	1,009	5,017	5,611	4,915	3,909	897	1,132	1,099	a 481	1,083	1,113
17	811	991	4,917	a 4,802	3,839	2,698	a 698	1,109	1,039	831	877	733
18	776	1,033	4,544	4,919	3,509	2,887	1,352	1,197	a 816	782	1,182	a 472
19	833	965	4,177	2,721	3,652	a2,925	1,203	1,221	1,424	712	1,025	975
20	845	a 681	a3,868	4,796	3,612	3,545	1,223	1,482	1,125	735	a 445	885
21	833	994	4,784	5,195	3,435	3,218	867	a1,144	1,137	638	1,149	799
22	1,235	963	4,940	5,586	a 3,047	2,892	959	1,618	899	538	1,096	786
23	a2,366	1,019	5,906	6,835	3,351	2,649	961	1,532	913	a 265	847	717
24	1,356	1,020	5,734	a 6,866	2,921	2,475	a 639	1,300	899	971	522	940
25	2,294	1,040	6,197	7,701	2,800	2,482	1,164	1,186	a 493	792	936	a 433
26	2,085	1,100	7,422	8,092	2,757	a2,157	1,120	1,045	1,029	709	843	743
27	1,988	a 752	a7,221	13,148	2,610	2,391	990	601	921	759	a 568	1,071
28	1,999	1,397	8,238	10,761	2,606	2,720	874	a 729	770	476	1,110	890
29	2,053	.....	8,137	10,741	a 2,100	1,893	809	1,088	657	693	940	936
30	a1,832	.....	8,734	10,900	2,565	1,757	845	1,014	909	a 359	834	1,056
31	2,155	.....	9,104	.....	2,358	.....	a 521	673	.....	874	.....	1,309

a Sunday.

Monthly discharge of Saco River at West Buxton, Maine, for 1910.

[Drainage area, 1,550 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Minimum.	Maximum.	Mean.	Per square mile.	
January	2,370	465	1,170	0.755	0.87
February	2,010	681	1,160	.748	.78
March	9,100	3,770	5,660	3.65	4.21
April	13,100	2,720	8,180	5.28	5.89
May	10,800	2,100	4,990	3.22	3.71
June	4,360	1,760	3,100	2.00	2.23
July	1,760	521	1,040	.671	.77
August	1,870	566	1,170	.755	.87
September	1,420	460	930	.600	.67
October	1,030	265	709	.457	.53
November	1,690	445	1,030	.655	.74
December	1,310	208	792	.511	.59
The year	13,100	208	2,490	1.61	21.86

MERRIMAC RIVER.

GENERAL FEATURES OF AREA DRAINED.

Merrimac River is formed near Franklin, N. H., by the union of Pemigewasset and Winnepesaukee rivers. The Winnepesaukee is a short stream flowing southwestward from Lake Winnepesaukee; the Pemigewasset is the outlet of Profile Lake in Franconia, N. H., 50 to 60 miles north of Franklin and less than 10 miles from Mount Washington. From Franklin the Merrimac flows southward for about 60 miles, crosses into Massachusetts, and a few miles below the State line, as it approaches the city of Lowell, turns abruptly and runs for some 40 miles to the ocean at Newburyport. Its total length is about 110 miles. Of its 5,015 square miles of drainage area, about 1,200 square miles is in Massachusetts, 211 square miles lying in the Nashua, Sudbury, and Lake Cochituate drainage areas, from which water is permanently diverted for the supply of the metropolitan district adjacent to Boston.

Important tributaries of the Merrimac, other than the headwater streams, are Contoocook, Suncook, Piscataquog, Souhegan, and Nashua rivers. Nashua River lies nearly all in Massachusetts, but enters the Merrimac near Nashua, N. H. The other tributaries mentioned are all in New Hampshire.

The headwaters of the Pemigewasset reach an elevation approximately 2,000 feet above the sea; at Franklin the river is at an elevation of about 270 feet. The upper portion of the basin is rough and mountainous and very largely in forest. Below Franklin the country is more uniform in topography and much of it is farm land.

The main river flows in reaches of moderate slope separated by fall over rock ledges. It is navigable as far as Haverhill, and for small boats as far as Lawrence.

The mean annual rainfall in this basin is about 42 inches, ranging from about 46 inches at Lowell to about 38 inches at Plymouth, but is probably much greater in the mountainous regions near the head of the Pemigewasset than elsewhere in the area. During the winter the streams are generally frozen, and especially in the northern parts of the region there is usually a heavy fall of snow.

The basin of the Merrimac is well supplied with natural facilities for storage, the combined area of lakes and ponds amounting to approximately 183 square miles. About 105 square miles of this is contained in Lake Winnepesaukee—next to Moosehead Lake the largest body of water in New England—which has about 4 feet of available depth of storage, corresponding to somewhat less than 8 billion cubic feet.

An act approved April 7, 1911, provides that between June 1 and September 15 of any year not more than an average of 250 second-

feet for any week shall be drawn from the lake when the level is 21 inches or less. From records maintained from 1860 to date it appears that the highest gage height recorded is 44 inches, which occurs when the lake is full. This stage has been recorded during 30 years since 1860. The lowest recorded stage was 11¼ inches, and occurred in February, 1911, the total recorded range thus being 55¼ inches.

Squam Lake, tributary to the Pemigewasset through Squam River at Ashland, is nearly 15 square miles in area. This lake can be drawn down 50 inches. Newfoundland Lake, with half the water area of Squam Lake, is also tributary to the Pemigewasset. It can be drawn down 58 inches.

The storage on all of these lakes and on numerous smaller ones is controlled by users of water power on the river and greatly improves the regimen of low-water flow. In a general way, the most favorable opportunities for storage on the Merrimac are being utilized, but in the upper portions of the drainage basin there are still many unutilized reservoir sites.

The Merrimac is world famous for its developed water powers. Lawrence, Lowell, and Manchester are great industrial centers, largely devoted to cotton and woolen manufactures, that owe their location to the excellent water power available at their sites. There are only one or two sites remaining for power development on the main river, but on the tributaries, especially the Pemigewasset and its tributaries, there is a large amount of unutilized fall. The longest available run-off record of flow on the Merrimac is that at Lawrence, extending back to 1890; the driest year was 1893; the wettest 1890; the total flow during these two years was about in the ratio of 1 to 1.93.

PEMIGEWASSET RIVER AT PLYMOUTH, N. H.

This station, which is located about 40 feet above the covered wooden highway bridge a short distance below the mouth of Bakers River in the town of Plymouth, was established September 5, 1903, in cooperation with the New Hampshire Forestry Commission.

Two gages have been maintained at this point. From September 4, 1903, to June 30, 1907, the station was maintained by the United States Geological Survey and readings were taken with the chain gage. Since the latter date gage heights have been furnished by the Locks & Canals Co., of Lowell, Mass., from readings taken on the staff gage.

The nearest dam is at the pulp mills at Livermore Falls, 3 miles upstream. Downstream the nearest dam is at Franklin, 25 miles distant.

The datum of the chain gage, which is attached to the upstream side of the bridge, has remained the same during the maintenance of the station. The datum of the staff gage belonging to the Locks &

Canals Co., which is about 40 feet above the bridge and on the same side of the river as the chain gage, is 1.11 feet higher than the chain-gage datum. All gage readings prior to 1910 were reduced to chain-gage datum. At low stages the difference in reading between the two gages is 1.11 feet, and at 8.1 feet (staff) the difference is 0.99 feet. Owing to the slight difference in relation of stage to discharge between the locations of the two gages and the fact that gage readings are now taken on the staff gage, it was considered advisable to publish all future gage heights, beginning with 1910, exactly as received from the Locks & Canals Co., namely, as referred to the staff-gage datum.

Discharge measurements are made from the bridge at ordinary and high stages. At low water the right channel is measured from the bridge and the left channel is measured by wading.

During the winter months the discharge is affected by ice.

Conditions for obtaining accurate discharge data are good, except at low stages, when the control of the flow at Livermore Falls affects the accuracy of the computed values of daily discharge. A good discharge rating curve has been developed.

Prior to 1903 a record of gage heights at Plymouth was obtained by the Locks & Canals Co., extending back to 1886, and estimates of discharge of the river were made covering this period and published in Water-Supply Paper 124, pages 97–101. At the time of publishing these estimates of discharge it was believed that conditions of flow were stable.

Two radical changes in conditions of flow have since occurred, one in 1905 and one in 1910, the discharge at a stage of 1.2 feet (chain gage) having varied as follows: 1904, discharge 110 second-feet; 1905, discharge 158 second-feet; 1910, discharge 213 second-feet. Hence, these earlier estimates of discharge should be used with caution for low stages, although they are probably essentially correct for medium and high stages.

The following discharge measurement was made by R. H. Bolster and C. C. Covert:

November 21, 1910: Width, 152 feet; area, 244 square feet; gage height,[1] 0.51 foot; discharge, 379 second-feet.

Daily gage height, in feet, of Pemigewasset River at Plymouth, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.25	1.4	7.5	6.2	.....	3.1	1.0	0.6	0.25	0.85	0.65	0.6
2	.....	1.25	8.9	6.0	3.0	2.9	.9	.5	.33	.....	.65	.5
3	1.0	1.1	7.0	.....	2.8	2.4	.....	.42	.33	.9	.6	.5
4	.9	1.0	5.7	4.4	4.0	2.1	.75	.42	.....	.9	3.0	.....
5	.9	1.5	4.0	5.0	3.4	.....	.85	6.1	.85	.75	2.5	.65

[1] Staff gage; chain gage read 1.62 feet.

Daily gage height, in feet, of Pemigewasset River at Plymouth, N. H., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
6	1.15	.....	.....	6.2	3.1	1.6	0.65	2.2	2.6	0.65	.....	0.65
7	1.1	1.8	3.1	7.6	2.4	2.8	.65	.....	3.0	.6	1.8	.6
8	1.1	1.8	4.4	5.6	.....	2.7	.6	1.25	1.9	.5	1.4	.6
9	.....	2.0	3.0	4.2	2.1	2.4	.6	1.0	1.25	.....	1.25	.85
10	1.5	1.7	2.5	.....	1.9	2.2	.....	.9	1.1	.6	1.15	.9
11	1.4	1.5	2.1	3.1	2.3	1.8	.5	.85	.....	.5	1.1	.....
12	1.25	1.25	2.0	2.6	2.0	.....	.5	1.1	.9	.5	1.0	.65
13	1.35	.....	.....	2.5	1.8	3.2	.42	1.0	.75	.42	.....	.6
14	1.35	1.15	1.9	2.2	1.8	2.6	.42	.....	1.0	.42	.9	1.0
15	1.15	1.5	1.6	2.4	.....	2.2	.33	.75	1.35	.33	.85	.9
16	.....	1.4	1.5	2.2	1.7	1.9	.42	2.2	1.1	.....	.85	.85
17	.75	1.4	1.35	.....	1.6	1.7	.....	1.15	.85	.5	.9	.85
18	.65	1.5	1.15	2.1	1.4	2.2	.5	1.1	.....	.42	.85	.....
19	1.35	1.5	.9	3.2	2.2	.....	.33	.9	.75	.42	.65	.65
20	1.25	.....	.....	4.5	2.0	2.0	.33	1.25	.65	.33	.....	.9
21	1.25	1.4	2.1	4.6	1.8	1.8	.33	.....	.65	.42	.6	.9
22	8.5	1.6	1.9	3.8	.....	1.7	.25	.85	.6	.33	.6	.85
23	.....	2.5	2.4	5.8	1.7	1.35	.33	.65	.6	.....	.5	.75
24	3.2	2.2	2.5	.....	1.6	1.4	.....	.6	.5	.5	.65	3.0
25	3.2	2.0	3.7	3.8	1.6	1.25	.25	.6	.....	.5	.65	.....
26	2.5	1.7	7.5	3.4	2.2	.....	.25	.5	.6	.42	.5	1.5
27	2.1	.....	.....	7.8	2.5	1.0	.25	.5	.5	.6	.....	1.1
28	1.9	1.9	4.1	5.2	2.2	1.7	.25	.....	1.15	.6	.5	2.1
29	1.7	.....	4.2	3.6	.....	1.5	.5	.33	1.5	1.15	.42	2.2
30	.....	.....	6.6	3.4	2.1	1.25	.42	.25	1.0	.....	.6	2.3
31	1.5	.....	6.4	.....	1.8	.....	.....	.25	.....	.75	.....	2.0

NOTE.—All gage heights for 1910 were taken from the record of the Locks & Canals Co. and refer to the staff gage.

Ice existed at the station from Jan. 1 to about Jan. 21, from about Feb. 1 to about Mar. 6, and from about Dec. 9 to 31. It is not known whether the gage readings were taken to water surface or to the top of the ice.

Daily discharge, in second-feet, of Pemigewasset River at Plymouth, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	7,000	2,670	2,560	665	425	269	570	452	425
2	.....	.....	.....	6,660	2,440	2,340	600	375	301	585	452	375
3	.....	.....	.....	5,420	2,230	1,820	555	339	301	600	425	375
4	.....	.....	.....	4,190	3,640	1,530	510	339	436	600	2,440	414
5	.....	.....	.....	*5,060	2,900	1,320	570	6,830	570	510	1,920	452
6	.....	.....	.....	7,000	2,560	1,100	452	1,620	2,020	452	1,590	452
7	.....	.....	2,560	9,590	1,820	2,230	452	1,230	2,440	425	1,260	425
8	.....	.....	4,190	6,000	1,680	2,120	425	835	1,350	375	945	425
9	.....	.....	2,440	3,920	1,530	1,820	425	665	835	400	835	.....
10	.....	.....	1,920	3,240	1,350	1,620	400	600	730	425	765	.....
11	.....	.....	1,530	2,560	1,720	1,260	375	570	665	375	730	.....
12	.....	.....	1,440	2,020	1,440	1,960	375	730	600	375	665	.....
13	.....	.....	1,400	1,920	1,260	2,660	339	665	510	339	632	.....
14	.....	.....	1,350	1,620	1,260	2,020	339	588	665	339	600	.....
15	.....	.....	1,100	1,820	1,220	1,620	301	510	908	301	570	.....
16	.....	.....	1,020	1,620	1,180	1,350	339	1,620	730	338	570	.....
17	.....	.....	908	1,580	1,100	1,180	357	765	570	375	600	.....
18	.....	.....	765	1,530	945	1,620	375	730	540	339	570	.....
19	.....	.....	600	2,660	1,620	1,530	301	600	510	339	452	.....
20	.....	.....	1,160	4,330	1,440	1,440	301	835	452	301	438	.....
21	.....	.....	1,530	4,470	1,260	1,260	301	702	452	339	425	.....
22	11,400	.....	1,350	3,380	1,220	1,180	269	570	425	301	425	.....
23	6,000	.....	1,820	6,320	1,180	908	301	452	425	338	375	.....
24	2,660	.....	1,920	4,850	1,100	945	284	425	375	375	452	.....
25	2,660	.....	3,260	3,380	1,100	835	269	425	400	375	452	.....
26	1,920	.....	9,400	2,900	1,620	750	269	375	425	339	375	.....
27	1,530	.....	6,590	9,980	1,920	665	269	375	375	425	375	.....
28	1,350	.....	3,780	5,360	1,620	1,180	269	338	765	425	375	.....
29	1,180	.....	3,920	3,140	1,580	1,020	375	301	1,020	765	339	.....
30	1,100	.....	7,710	2,900	1,530	835	339	269	665	638	425	.....
31	1,020	.....	7,350	.....	1,260	.....	382	269	.....	510	.....	.....

NOTE.—Daily discharge determined from a well-defined discharge rating curve. Discharge for Sundays and other days when the gage was not read was interpolated, except that for Jan. 23, which was estimated from the discharge at Franklin Junction. The accuracy of the computed daily discharge at low stages is affected by control of the discharge at the pulp mills at Livermore Falls, about 3 miles above Plymouth.

Monthly discharge of Pemigewasset River at Plymouth, N. H., for 1910.

[Drainage area, 615 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	11,400	.....	1,190	1.93	2.22	D.
February	.....	.....	530	.862	.90	D.
March	9,400	600	3,240	5.27	6.08	C.
April	9,980	1,530	4,210	6.85	7.64	A.
May	3,640	945	1,660	2.70	3.11	A.
June	2,660	665	1,490	2.42	2.70	A.
July	665	269	380	.618	.71	B.
August	6,830	269	818	1.33	1.53	A.
September	2,440	269	691	1.12	1.25	A.
October	765	301	426	.693	.80	B.
November	2,440	339	698	1.13	1.26	A.
December	.....	.....	504	.820	.94	D.
The year	11,400	.....	1,320	2.15	29.14	

NOTE.—The discharge for the periods during which ice was present was estimated by means of climatological records and the discharge records at Franklin Junction and Garvins Falls.

Mean discharge Jan. 1 to 21, estimated, 295 second-feet; practically constant. The discharge for February varied from about 350 to 1,000 second-feet. Mean discharge Mar. 1 to 6, estimated, 4,920 second-feet, ranging from 8,000 to 3,000 second-feet. Mean discharge Dec. 9 to 31, estimated, 534 second-feet, ranging from 300 to 1,500 second-feet.

MERRIMAC RIVER AT FRANKLIN JUNCTION, N. H.

This station, which is located at the wooden bridge near Franklin Junction, about 1 mile below the union of Pemigewasset and Winnepesaukee rivers, was established July 8, 1903.

Since June 30, 1907, gage heights at this point have been furnished by the Locks & Canals Co., of Lowell, Mass.

The records at this station, in conjunction with those at Garvins Falls and Lawrence, furnish fairly complete information regarding the daily distribution of flow of the main river.

There are dams on both Pemigewasset and Winnepesaukee rivers within 2 miles of the station. The nearest dam downstream is at Sewall Falls, near Concord, distant some 15 miles.

The datum of the chain gage attached to the railroad bridge has remained the same since the establishment of the station.

The operation of mills above the station causes more or less fluctuation in stage each working day. It is not known how much this affects the reliability of the records.

Discharge measurements are made from the bridge.

During the winter months the discharge is affected by ice.

Conditions for obtaining accurate discharge data are good; a good discharge rating curve has been developed for this station.

The following discharge measurement was made by C. C. Covert and R. H. Bolster:

Nov. 22, 1810: Width, 214 feet; area, 700 square feet; gage height, 3.99 feet; discharge, 1,050 second-feet.

Daily gage height, in feet, of Merrimac River at Franklin Junction, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.15	5.55	.....	8.80	.....	5.85	4.38	4.18	3.92	4.32	4.00	4.00
2	.....	5.48	7.90	8.45	6.35	5.92	4.30	4.20	3.90	.....	3.90	4.02
3	4.22	5.42	7.05	.....	6.20	5.82	.....	4.22	3.95	4.22	4.15	4.02
4	4.15	5.38	6.72	7.25	.....	5.78	.....	4.22	.....	4.25	5.40	3.75
5	4.10	5.30	6.68	6.85	6.80	.....	4.30	4.70	.....	4.10	5.38	3.92
6	4.30	.....	.....	7.45	6.28	5.62	4.28	4.80	.....	4.08	5.00	3.90
7	4.32	5.42	6.52	.....	6.22	5.72	4.30	.....	.....	4.20	5.18	3.95
8	4.30	4.72	6.40	8.25	.....	5.80	4.28	4.72	.....	4.12	5.02	3.88
9	.....	.....	6.15	7.55	6.22	5.88	4.32	4.55	4.20	3.85	4.90	3.85
10	.....	4.62	6.12	.....	6.08	5.80	.....	4.52	4.12	4.10	4.82	3.90
11	.....	4.52	6.02	6.22	5.95	5.98	4.30	4.42	.....	4.05	4.75	.....
12	.....	4.5	5.90	6.15	5.92	.....	4.25	4.45	4.05	3.95	4.68	3.82
13	4.32	.....	.....	6.02	5.50	5.90	4.25	4.40	4.02	3.90	4.25	3.80
14	4.30	4.52	5.98	5.88	5.38	5.62	4.22	.....	4.10	3.88	4.42	3.82
15	4.32	4.58	5.90	5.72	.....	5.35	4.20	4.35	4.10	4.00	4.40	3.80
16	.....	4.60	5.82	5.62	5.20	.....	4.18	4.45	4.12	.....	4.35	3.82
17	4.30	4.52	5.70	.....	5.12	5.18	.....	4.40	4.02	3.85	4.28	3.82
18	4.35	4.55	5.72	5.25	5.02	5.05	4.20	4.52	.....	3.92	4.20	.....
19	4.20	4.48	5.62	5.30	4.95	.....	4.15	4.50	4.10	4.00	4.12	3.80
20	4.22	.....	.....	6.52	.....	4.98	4.12	4.40	4.12	4.02	.....	3.78
21	4.20	4.68	5.62	7.00	.....	4.90	4.10	.....	4.02	4.05	4.02	3.75
22	6.30	4.60	5.85	6.68	.....	4.80	4.05	4.38	4.00	4.02	4.00	3.80
23	11.10	4.62	5.90	6.05	4.82	4.78	.....	4.30	3.98	4.10	4.00	3.88
24	7.05	4.70	6.20	.....	5.10	4.70	.....	4.22	3.92	4.10	3.92	.....
25	6.15	4.75	.....	5.90	5.02	4.72	.....	4.10	.....	4.05	4.00	.....
26	6.15	.....	10.00	6.50	4.95	.....	.....	4.05	3.85	4.12	3.98	.....
27	5.95	.....	.....	10.50	5.80	4.65	4.18	4.00	3.98	4.02	3.75	4.38
28	5.72	.....	7.75	8.75	5.65	4.60	4.20	.....	4.02	4.05	3.92	4.42
29	5.65	.....	7.10	7.40	.....	4.52	4.22	3.95	4.12	4.00	4.00	4.38
30	.....	.....	9.58	.....	.....	4.48	4.20	4.02	4.42	3.80	3.92	4.40
31	5.62	.....	9.50	.....	5.38	.....	.....	3.92	.....	3.98	.....	4.35

NOTE.—Ice was present at this station from Jan. 1 to about Jan. 21, from about Jan. 26 to about Feb. 13, and from about Dec. 7 to about Dec. 26. It is not known whether the readings were to water surface or to the top of the ice.

Daily discharge, in second-feet, of Merrimac River at Franklin Junction, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	4,000	9,400	5,290	3,740	1,520	1,280	972	1,450	1,060	1,060
2	.....	.....	7,600	8,700	4,630	3,860	1,420	1,300	950	1,380	950	1,080
3	.....	.....	5,940	7,510	4,360	3,690	1,420	1,320	1,000	1,320	1,240	1,080
4	.....	.....	5,310	6,320	4,910	3,630	1,420	1,320	1,100	1,360	3,000	800
5	.....	.....	5,230	5,560	5,460	3,490	1,420	1,950	1,200	1,180	2,970	972
6	.....	.....	5,010	6,700	4,500	3,350	1,400	2,090	1,700	1,160	2,380	950
7	.....	.....	4,940	8,500	4,400	3,520	1,420	2,040	1,800	1,300	2,650	.....
8	.....	.....	4,720	8,300	4,400	3,660	1,400	1,980	1,500	1,200	2,410	.....
9	.....	.....	4,270	6,900	4,400	3,800	1,450	1,740	1,300	900	2,230	.....
10	.....	.....	4,220	5,650	4,140	3,660	1,440	1,710	1,200	1,180	2,120	.....
11	.....	.....	4,040	4,400	3,920	3,970	1,420	1,580	1,160	1,120	2,020	.....
12	.....	.....	3,830	4,270	3,860	3,900	1,360	1,620	1,120	1,000	1,920	.....
13	.....	.....	3,900	4,040	3,160	3,830	1,360	1,550	1,080	950	1,360	.....
14	.....	1,710	3,970	3,800	2,970	3,350	1,320	1,520	1,180	930	1,580	.....
15	.....	1,780	3,830	3,520	2,820	2,920	1,300	1,480	1,180	1,060	1,550	.....
16	.....	1,810	3,690	3,350	2,680	2,780	1,280	1,620	1,200	980	1,480	.....
17	.....	1,710	3,490	3,060	2,560	2,650	1,290	1,550	1,080	900	1,400	.....
18	.....	1,740	3,520	2,760	2,410	2,460	1,300	1,710	1,130	972	1,300	.....
19	.....	1,650	3,350	2,840	2,300	2,400	1,240	1,680	1,180	1,060	1,200	.....
20	.....	1,780	3,350	4,940	3,000	2,350	1,200	1,550	1,200	1,080	1,140	.....

Daily discharge, in second-feet, of Merrimac River at Franklin Junction, N. H., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	.....	1,920	3,350	5,840	2,600	2,230	1,180	1,540	1,080	1,120	1,080	.....
22	4,540	1,810	3,740	5,230	2,400	2,090	1,120	1,520	1,060	1,080	1,060	.....
23	14,200	1,840	3,830	4,090	2,120	2,060	1,300	1,420	1,040	1,180	1,060	.....
24	5,940	1,950	4,360	5,000	2,530	1,950	1,200	1,320	972	1,180	972	.....
25	4,270	2,020	8,130	3,830	2,410	1,980	1,200	1,180	936	1,120	1,060	.....
26	.....	2,100	11,900	4,900	2,300	1,930	1,200	1,120	900	1,200	1,040	.....
27	.....	2,100	9,600	13,000	3,660	1,880	1,280	1,060	1,040	1,080	800	1,520
28	.....	2,100	7,300	9,300	3,400	1,810	1,300	1,030	1,080	1,120	972	1,580
29	.....	.....	6,030	6,600	3,260	1,710	1,320	1,000	1,200	1,060	1,060	1,520
30	.....	.....	11,000	5,940	3,110	1,650	1,300	1,080	1,580	850	972	1,550
31	.....	.....	10,900	.....	2,970	.....	1,290	972	.....	1,040	.....	1,480

NOTE.—Daily discharge determined from a fairly well defined discharge rating curve. Discharge interpolated for Sundays and other days when the gage was not read, except Feb. 26 to Mar. 1, Apr. 7 and 24, May 20 to 22, July 23 to 26, and Sept. 4 to 8, when the discharge was estimated from the discharge record at Garvins Falls.

Monthly discharge of Merrimac River at Franklin Junction, N. H., for 1910.

[Drainage area, 1,460 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	14,200	.....	2,040	1.40	1.61	C.
February	.....	.....	1,680	1.15	1.20	C.
March	11,900	3,350	5,430	3.72	4.29	B.
April	13,000	2,760	5,810	3.98	4.44	B.
May	5,460	2,120	3,450	2.36	2.72	B.
June	3,970	1,650	2,880	1.97	2.20	B.
July	1,520	1,120	1,320	.904	1.04	B.
August	2,090	972	1,480	1.01	1.16	B.
September	[a]1,800	900	1,170	.801	.89	B.
October	1,450	850	1,110	.760	.88	B.
November	3,000	800	1,530	1.05	1.17	B.
December	1,580	.....	903	.618	.71	C.
The year	14,200	.....	2,400	1.64	22.31	

[a] Estimated.

NOTE.—Discharge for the periods during which ice was present, estimated from the discharge record at Garvins Falls and on climatologic records.

Mean discharge Jan. 1 to 21 estimated 910 second-feet; nearly constant.

Mean discharge Jan. 26 to 31 estimated 2,550 second-feet; ranging from 3,500 to 2,000 second-feet.

Mean discharge Feb. 1 to 13 estimated 1,460 second-feet; practically constant.

Mean discharge Dec. 7 to 26 estimated 720 second-feet; nearly constant.

The accuracy is marked low because there is reason to believe that the daily gage readings by the observer, from which the discharge was derived, were not good.

MERRIMAC RIVER AT GARVINS FALLS, N. H.

The power at Garvins Falls, 4 miles below Concord, is one of the best on Merrimac River. There has been a dam at this point since 1815, first in connection with the Old Bow canal, and later to furnish power for a pulp mill. This privilege has since become the property of the Manchester Traction, Light & Power Co., and has been more completely developed. During 1903–4 an overfall dam of the ogee type, somewhat similar in cross section to the dam at Holyoke, was completed. This dam is 550 feet long between abutments and about 800 feet over all, including head gates, and is of

stone masonry, substantially built. A canal has been completed which is about 500 feet long and 74 feet wide at the water line, and wasteways are provided from the sides of this, one 90 feet long at elevation 102 (the main crest of the dam being taken as elevation 100) and another 45 feet long at elevation 103. A waste gate 10 feet wide and capable of being lowered to elevation 93 is also provided, for use especially in floating out any obstructions which lodge against the racks. The new dam and head gates to the canal are situated about 800 feet downstream from the old dam, which was destroyed on the completion of the new structure. There are six triplex turbines, of somewhat over 1,000 horsepower each, and one small duplex turbine, of 75 horsepower, used in running exciters. Each large unit has three 39-inch runners, mounted on a horizontal shaft, which revolves at 180 revolutions a minute. Two of the wheels in each set discharge through a common T center and draft tube near the fore-bay wall. The third wheel is set opposite a quarter turn at the downstream end of the casing and discharges through this quarter turn into a smaller draft tube. The top of the penstock opening is at elevation 95.5; the lower ends of the draft tubes are horizontal and are about 2 feet below the level of usual tail water. The gates for the runners are of the plain cylindrical pattern, without fingers, and are controlled by governors. The average head on the wheels is about 29 feet, and there are six 650-kilowatt 3-phase generators direct connected with the turbines. The power developed is transmitted at 12,000 volts tension to Manchester, about 14 miles away, where it enters a substation and is transformed to a lower voltage and through a distributing switchboard utilized for light and power. The Garvins Falls station is one of a system of three water-power plants and one steam-power plant operated by this company.

Careful records of the pond and tail-race levels, wheel openings, etc., have been kept by the company since the completion of the new dam in 1904, and have been furnished for computations of flow by J. Brodie Smith, manager. The original computations for 1910 have been furnished by Hollis French and Allen Hubbard, consulting engineers for the power company. A number of current-meter measurements have been made from time to time by the hydrographers of the Survey for the purpose of rating turbines and to assist in computing flow over the dam.

Conditions are favorable at this station for accurate records of discharge. The flow over the dam is affected somewhat by ice during the winter.

The maximum daily discharge during the maintenance of the station occurred March 31, 1905, and was about 33,970 second-feet. Discharge for the minimum week occurred December 17 to 23, 1910, and averaged 800 second-feet.

Daily discharge, in second-feet, of Merrimac River at Garvins Falls, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	953	2,490	5,297	14,221	a7,856	2,591	2,206	1,289	1,031	1,541	1,273	1,596
2	a667	2,174	12,934	13,120	6,958	3,594	1,430	1,436	967	a1,071	1,161	1,604
3	1,450	2,468	14,018	a12,295	6,479	3,459	a1,352	1,568	1,107	1,481	1,309	1,416
4	1,324	2,166	12,564	8,172	5,896	3,615	1,355	1,619	a769	1,360	1,446	a807
5	1,373	2,098	9,982	8,040	7,648	a2,538	1,598	2,260	1,094	1,469	2,626	1,587
6	1,396	a1,654	a9,485	8,937	6,729	2,465	1,659	4,013	1,161	1,612	a2,624	1,410
7	1,346	1,759	8,402	10,750	5,611	3,367	1,577	a2,351	2,137	1,374	2,628	1,324
8	1,222	2,013	10,161	10,931	a4,946	4,000	1,545	1,867	2,440	1,305	2,217	1,145
9	a731	2,197	10,109	8,625	4,046	3,981	1,345	1,945	2.082	a730	2 042	1,285
10	1,131	2,195	8,682	a6,395	3,964	3,418	a1,218	1,850	1,784	1,144	2,010	1,141
11	1,211	2,268	5,937	5,280	4,260	3,115	1,661	1,904	a1,277	1,341	1,970	a771
12	1,683	2,184	6,086	4,518	3,934	a3,624	1,446	1,798	1,545	1,242	1,859	1,246
13	1,477	a2,099	a5,778	4,314	3,668	4,817	1,467	1,686	1,589	989	a1,187	1,241
14	1,384	2,111	5,531	3,839	3,267	5,046	1,289	a1,248	1,615	1,207	1,909	1,042
15	1,264	2,071	4,745	3,499	a3,127	3,961	1,114	1,056	1,720	1,047	1,922	796
16	a918	2,126	4,888	3,246	3,177	3,322	1,273	1,662	1,785	a740	1,735	917
17	1,366	2,268	4,532	a2,997	2,968	3,221	a884	2,039	1,741	1,194	1,540	895
18	1,467	2,200	3,608	2,879	2,718	3,391	1,363	1,919	a1,183	1,135	1,510	a728
19	1,317	2,302	4,105	3,471	2,887	a4,358	1,232	1,820	1,752	965	1,353	626
20	1,405	a2,285	a4,202	6,959	3,814	3,747	1,218	1,725	1,511	1,135	a549	788
21	1,298	2,206	4,687	7,267	3,301	3,260	1,425	a1,278	1,190	1,123	1,693	924
22	4,065	2,068	5,498	6 353	a3,267	2,671	1,415	1,688	1,245	1,070	1,755	826
23	a12,613	2,766	5,966	7,646	2,861	2,504	1,187	1,594	1,360	a663	1,600	810
24	13,020	2,968	6,372	a9,755	2,945	2,333	a1,023	1,588	1,065	1,115	746	1,088
25	8,261	3,158	7,430	7,062	2,822	2,229	1,581	1,230	a822	1,241	1,627	a677
26	6,270	3,010	12,523	6,607	3,070	a1,831	1,288	1,228	1,211	1,143	1,445	734
27	5,007	a3,157	a11,847	10,064	3,699	1,856	1,291	1,114	1,300	1,376	a862	1,470
28	4,111	3,272	12,823	12,761	3,583	1,783	1,302	a673	1,219	1,235	1,428	1,858
29	3,773	.....	9,948	11,195	a2,851	2,050	1,261	1,155	1,182	1,199	1,711	1,611
30	a3,020	.....	12,550	7,939	2,492	2,500	1,165	1,155	1,277	a686	1,497	1,998
31	2,867	.....	13,927	.....	2,403	.....	a1,007	1,159	.....	1,278	.....	1,742

a Sunday.

Monthly discharge of Merrimac River at Garvins Falls, N. H., for 1910.

[Drainage area, 2,340 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	13,020	667	2,880	1.23	1.42
February	3,272	1,654	2,350	1.00	1.04
March	14,018	3,608	8,210	3.51	4.05
April	14,221	2,879	7,640	3.26	3.64
May	7,856	2,403	4,100	1.75	2.02
June	5,046	1,783	3,150	1.35	1.51
July	2,206	884	1,360	.581	.67
August	4,013	673	1,640	.701	.81
September	2,440	769	1,410	.603	.67
October	1,612	663	1,170	.500	.58
November	2,628	549	1,640	.701	.78
December	1,998	626	1,160	.496	.57
The year	14,221	549	3,060	1.31	17.76

MERRIMAC RIVER AT LAWRENCE, MASS.

Records of flow of the Merrimac at Lawrence have been kept for more than 50 years, but have been published only since 1890. Data in regard to the flow are furnished by R. A. Hale, principal assistant engineer of the Essex Water Power Co.

The station is located at the dam of the Essex Co. in Lawrence, and a careful record is kept of the flow over the dam and through the various wheels and gates in connection with the sale of power. The nearest dam on the river upstream is at Lowell, about 12 miles away, while a short distance below the Lawrence dam the river is within reach of tidal effect at high tide.

Water is diverted from the drainage basins of Sudbury and Nashua rivers for use by the metropolitan district in the vicinity of Boston, but during a portion of the year water is wasted into the Merrimac at these diversion dams, consequently the drainage area is somewhat variable.

The drainage areas are as follows:

	Square miles.
Total of Merrimac River drainage basin above Lawrence	4,663
Nashua River drainage basin above gaging station at Clinton, Mass.	118
Sudbury River drainage basin, Framingham, dam No. 1	75
Cochituate River drainage basin	18
Total of Nashua, Sudbury, and Cochituate river drainage basins.	211
Net drainage basin of Merrimac River, excluding Nashua, Sudbury, and Cochituate river basins	4,452

The quantity as measured at Lawrence includes the water from Sudbury, Nashua, and Cochituate rivers, and in getting the absolute yield of the river this should be considered in reference to the drainage areas, either by deducting it from the Merrimac flow and using the net area and the net flow of the Merrimac, or by getting the total yield of both the Sudbury and Nashua rivers with the Merrimac and using the total area.

The accompanying tables, furnished by Mr. Hale, give the flow of the Merrimac at Lawrence, and also the quantity wasted from the Sudbury and Nashua drainage basins into the Merrimac, the latter being based on data furnished by the Metropolitan Water and Sewerage Board of Boston.

Much care is taken in procuring the base data used and in making computations, and these records are regarded as excellent.

The maximum daily discharge during the maintenance of the station occurred in March, 1896, and was about 82,150 second-feet, this being the greatest flood since that of 1846. The discharge for the minimum week occurred December 20 to 26, 1910, and averaged 1,060 second-feet. It should be observed, however, that this week included two storage days.

Average weekly discharge, in second-feet, arranged in order of dryness, of Merrimac River at Lawrence, Mass., for 1910.

[Total drainage area 4,663 square miles.]

Week ending Sunday—	Merrimac River at Lawrence (4,663 square miles).	Wasting into Merrimac from—				Net yield of Merrimac River from 4,452 square miles.	
		Nashua River at Clinton (118 square miles).	Sudbury River at dam No. 1 (75 square miles).	Lake Cochituate, Bannister Brook (18 square miles).	Total waste of these basins (211 square miles).	Per week.	Per square mile.
	Sec.-ft.	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*
Dec. 18	1,131	2	8	0	10	1,121	0.252
25	1,187	3	21	0	24	1,163	.261
Oct. 30	1,251	3	2	0	5	1,246	.280
Sept. 4	1,279	3	2	0	5	1,274	.286
Oct. 23	1,332	6	2	0	8	1,324	.297
16	1,451	2	2	0	4	1,447	.325
Nov. 27	1,484	2	9	0	11	1,473	.331
Oct. 9	1,487	4	2	0	6	1,481	.333
Dec. 11	1,572	3	14	0	17	1,555	.349
July 24	1,577	4	2	0	6	1,571	.353
Oct. 2	1,614	3	2	0	5	1,609	.361
July 31	1,619	3	2	0	5	1,614	.363
Nov. 6	1,619	4	8	0	12	1,607	.361
Sept. 25	1,633	3	2	0	5	1,628	.366
Jan. 9	1,652	2	48	0	50	1,602	.360
Dec. 4	1,851	3	13	0	16	1,835	.412
Sept. 18	1,860	3	2	0	5	1,855	.417
July 10	1,918	3	4	18	25	1,893	.425
Aug. 28	1,948	3	2	0	5	1,943	.436
Jan. 1, 1911	1,948	2	33	0	35	1,913	.430
Sept. 11	1,997	3	2	0	5	1,992	.447
July 17	2,027	3	2	0	5	2,022	.454
Aug. 21	2,050	3	2	0	5	2,045	.459
Nov. 20	2,056	2	7	0	9	2,047	.460
Aug. 14	2,063	3	2	0	5	2,058	.462
Jan. 16	2,116	3	60	0	63	2,053	.461
Aug. 7	2,382	4	2	0	6	2,376	.534
July 3	2,749	2	18	39	59	2,690	.604
Nov. 13	2,947	5	34	0	39	2,908	.653
Feb. 20	3,730	3	101	44	148	3,582	.805
13	3,789	3	77	29	109	3,680	.827
June 26	4,415	2	47	47	96	4,319	.970
5	4,421	3	9	8	20	4,401	.989
Jan. 23	4,897	3	177	0	180	4,717	1.060
May 29	4,968	9	10	3	22	4,946	1.111
June 12	4,977	2	49	0	51	4,926	1.106
Feb. 6	5,118	3	122	0	125	4,993	1.122
27	5,209	3	152	65	220	4,989	1.121
May 22	5,222	10	10	11	31	5,191	1.166
June 19	6,439	2	91	51	144	6,295	1.414
Apr. 17	6,459	2	42	87	131	6,328	1.421
May 15	6,558	1	4	8	13	6,545	1.470
Apr. 24	9,248	3	50	47	100	9,148	2.055
May 8	10,117	11	28	16	55	10,062	2.260
Mar. 20	11,085	3	107	25	135	10,950	2.460
Jan. 30	11,158	3	195	0	198	10,960	2.462
Apr. 10	11,994	2	57	16	75	11,919	2.677
Mar. 27	13,324	3	108	22	133	13,191	2.963
May 1	14,182	2	64	29	95	14,087	3.164
Apr. 3	16,570	2	94	15	111	16,459	3.697
Mar. 13	17,781	3	197	57	257	17,524	3.934
6	21,557	3	402	112	517	21,046	4.726
Weekly average	4,904	3	48	15	66	4,838	1.087

Daily discharge, in second-feet, of Merrimac River at Lawrence, Mass., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,233	6,244	16,620	18,030	a**11,887**	3,808	2,466	2,573	1,704	1,224	1,452	2,490
2	a **115**	5,784	25,300	16,096	11,641	4,307	1,557	2,296	1,859	a 136	1,370	2,467
3	1,929	5,329	**28,420**	a14,154	10,422	5,597	a1,364	2,101	1,059	1,848	**1,563**	1,843
4	1,975	5,016	25,750	13,412	9,909	4,480	1,770	2,148	a **126**	1,795	1,869	a 110
5	1,829	3,034	24,730	11,799	10,374	a3,417	2,841	2,374	221	1,818	1,515	1,961
6	1,669	a 2,996	a21,774	11,266	10,966	4,898	2,129	2,080	2,370	1,810	a2,005	1,948
7	2,145	4,880	21,182	12,915	9,630	3,757	2,119	a3,103	2,108	1,831	**4,555**	1,969
8	1,761	3,771	21,677	13,361	a 7,880	4,832	2,059	**3,531**	2,300	1,146	4,144	1,988
9	a 257	4,014	21,685	11,618	7,904	5,862	1,425	2,543	**3,239**	a 163	3,402	1,915
10	2,481	4,205	18,475	a 9,586	7,413	5,495	a1,085	2,050	2,254	1,848	3,172	1,139
11	2,511	4,225	16,030	9,020	7,167	4,684	**3,139**	2,173	a1,489	**2,068**	3,046	a 87
12	2,485	2,730	13,427	7,777	6,928	a5,310	2,450	2,191	2,817	**1,218**	1,870	1,588
13	2,520	a **2,696**	a11,990	7,015	6,378	7,815	2,364	1,597	2,492	1,970	a 442	1,389
14	2,665	4,931	12,531	6,070	5,282	**8,036**	2,279	a 358	2,315	1,821	3,042	1,345
15	1,753	4,091	12,052	5,406	a 4,835	7,228	2,316	2,613	2,119	1,123	2,676	1,355
16	a 395	3,689	11,468	5,056	5,970	6,005	1,511	2,617	1,948	a 111	2,546	1,359
17	3,032	3,712	10,727	a **4,871**	5,175	5,307	a **128**	2,140	1,165	1,710	2,486	797
18	2,817	4,100	11,661	5,958	4,767	5,009	1,916	2,171	a 166	1,632	2,275	a **81**
19	2,756	2,783	10,965	5,170	4,941	a5,674	1,956	2,746	1,962	1,630	1,192	1,365
20	2,901	a 2,807	a **8,189**	8,898	5,129	7,046	1,952	1,776	2,061	1,592	a **173**	1,392
21	2,937	4,991	10,016	11,276	5,398	5,974	1,956	a 289	2,048	1,651	1,792	1,377
22	5,588	4,771	10,825	10,911	a 5,175	5,075	1,916	2,823	2,004	1,003	2,185	1,389
23	a14,245	5,209	11,583	10,207	6,092	4,499	1,201	2,708	1,988	a 105	2,195	1,414
24	**18,698**	5,817	11,842	a12,315	5,367	3,759	a 140	2,384	1,233	1,551	517	948
25	15,123	5,908	12,725	11,759	5,097	**2,236**	1,978	2,033	a 137	1,380	2,091	a 421
26	11,927	5,055	16,044	10,211	4,714	a2,318	2,312	2,229	1,898	1,429	1,427	464
27	10,059	a 4,712	a20,231	12,793	4,774	4,341	2,185	1,340	2,012	1,573	a 183	2,856
28	8,351	**8,307**	18,353	**20,526**	4,465	3,491	1,968	a **120**	1,956	1,727	1,982	2,393
29	7,330	.....	16,011	18,118	a 4,267	3,291	1,484	1,320	2,041	1,000	2,156	2,446
30	a 6,620	.....	15,394	13,980	**3,953**	2,730	1,055	1,396	2,029	a **94**	2,266	**2,968**
31	7,421	.....	17,953	.....	5,385	.....	a 351	1,486	.....	1,560	.....	1,949

a Sunday.

NOTE.—Maximum and minimum appear in bold-face type.

Monthly discharge of Merrimac River at Lawrence, Mass., for 1910.

[Total drainage area =4,663 square miles.]

Month.	Mean discharge of Merrimac River at Lawrence as measured (4,663 square miles).	Average amount wasting into Merrimac River from watershed.				Average yield of Merrimac River from watershed of 4,452 square miles.		Run-off (depth on drainage area).
		Nashua River at Clinton (118 square miles).	Sudbury River at dam No. 1 (75 square miles).	Lake Cochituate, Bannister Brook (18 square miles).	Total (211 square miles).		Per square mile.	
	Sec.-ft.	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Inches.*
January	4,759	2	115	0	117	4,642	1.043	1.20
February	4,493	3	121	37	161	4,332	.973	1.01
March	16,311	3	184	49	236	16,075	3.611	4.16
April	10,986	2	57	42	101	10,885	2.445	2.73
May	6,751	8	14	10	32	6,719	1.509	1.74
June	4,876	2	49	30	81	4,795	1.077	1.20
July	1,786	3	3	7	13	1,773	.398	.46
August	2,042	3	2	0	5	2,037	.458	.53
September	1,771	3	2	0	5	1,766	.397	.44
October	1,341	4	2	0	6	1,335	.300	.35
November	2,053	3	15	0	18	2,035	.457	.51
December	1,511	3	18	0	21	1,490	.335	.39
Yearly average	4,890	3	48	15	66	4,824	1.084	14.72

NOTE.—Total drainage area 4,663 square miles, less diverted area 211 square miles =4,452 square miles

SOUHEGAN RIVER AT MERRIMAC, N. H.

Souhegan River is formed in the hills and mountains of southern New Hampshire, in the townships of Temple and New Ipswich, one branch starting from the township of Ashby, Mass. The stream flows in a general northeasterly direction to Wilton, where it is joined by Stony Branch, then flows eastward, and joins Merrimac River at Merrimac, N. H. Baboosic Stream enters near its mouth, just below the mill of the W. H. McElwain Co.

The fall of the stream is very large, its bed and banks are rocky, and it affords numerous power sites.

The mean annual precipitation in this basin is about 42 inches. Winters are rather severe. The average depth of snowfall in January and February is about 18 inches.

The gaging station, which was established July 13, 1909, in cooperation with the W. H. McElwain Co., is located about 1½ miles upstream from this company's dam and just above Atherton Falls. The slope of the river below the station is very great, falls and rips extending for three-fourths of a mile.

A vertical staff gage is located on the left bank about 40 feet above the falls. A chain gage for use during high water is attached to a tree a short distance upstream from the staff gage. All published readings are referred to the staff gage. Discharge measurements are made by wading or from bridges above and below the station. There is a relatively sharp crested control at the head of the falls immediately below the gage and hence there is usually no great amount of ice effect at the station until ice lodges at this point.

There is mill control on this stream at Milford about 8 to 10 miles above the station. This control is shown by a few hundredths of a foot difference between the morning and afternoon gage readings. It is assumed in publishing the following discharge values that the average of these readings gives essentially the true 24-hour mean. No information is available regarding night storage at Milford.

Discharge measurements of Souhegan River at Merrimac, N. H., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 3[a]	D. M. Wood	145	823	5.65	1,910
29[b]	do			4.22	730
Apr. 11[c]	do	54	203	3.06	255
21[d]	do	117	1,110	3.64	518
June 3	do	52	77.6	2.65	115

[a] Ice present. Ice 1.3 feet thick. Gage height probably not materially affected on account of the sharp crest of the control point below the station.
[b] Made from railroad bridge; probably affected by storage in the mill pond between the gage and the point of measurement.
[c] Made from covered highway bridge 1½ miles above gage.
[d] Made from railroad bridge.

Daily gage height, in feet, of Souhegan River at Merrimac, N. H., for 1910.

[G. M. Norton, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.35	3.25	7.60	4.07	3.54	2.66	2.51	2.22	2.00	2.14	2.38	2.42
2	2.37	3.17	6.80	4.02	3.48	2.65	2.49	2.29	2.00	2.28	2.37	2.42
3	2.35	3.15	5.65	3.92	3.37	2.66	2.44	2.24	2.00	2.33	2.41	2.32
4	2.36	3.10	4.95	3.52	3.40	2.64	2.35	2.11	2.04	2.11	2.48	2.31
5	2.38	3.00	4.42	3.32	3.42	2.61	2.34	2.24	2.10	2.14	2.57	2.03
6	2.40	2.95	.....	3.27	3.41	2.69	2.31	2.18	2.10	2.12	2.62	2.06
7	2.47	2.94	5.22	3.23	3.34	3.12	2.28	2.17	2.32	2.12	2.56	2.05
8	2.50	3.00	5.20	3.32	3.12	3.04	2.27	2.22	2.40	2.14	2.52	2.12
9	2.37	3.02	5.74	3.29	2.96	2.96	2.31	2.19	2.42	2.15	2.52	2.11
10	2.40	2.95	5.42	3.27	3.14	2.96	2.36	2.40	2.37	2.20	2.47	2.12
11	2.45	2.95	5.23	3.10	3.14	3.20	2.33	2.34	2.41	2.18	2.41	2.12
12	2.50	2.93	5.18	3.12	3.15	3.33	2.32	2.27	2.28	2.30	2.34	2.12
13	2.47	.....	5.02	3.22	3.04	3.58	2.27	2.33	2.17	2.14	2.32	2.11
14	2.45	3.00	4.52	3.12	3.04	3.40	2.26	2.29	2.11	2.20	2.33	2.09
15	.....	2.85	4.62	3.07	3.00	3.22	2.24	2.16	2.11	2.16	2.32	2.07
16	2.51	2.90	4.67	3.12	2.96	3.01	2.24	2.20	2.08	2.23	2.37	2.06
17	2.50	2.95	4.64	3.04	2.93	3.00	2.18	2.19	2.08	2.24	2.28	2.08
18	2.50	3.05	4.62	3.02	2.97	3.16	2.13	2.38	2.11	2.15	2.23	2.08
19	2.51	3.10	4.52	4.52	3.12	3.14	2.13	2.40	2.14	2.17	.....	2.08
20	2.50	3.15	4.62	4.02	3.07	3.16	2.10	2.40	2.23	2.20	2.32	2.06
21	2.51	3.20	4.72	3.65	3.00	3.14	2.07	2.50	2.22	2.20	.....	2.05
22	3.35	3.90	4.72	3.57	3.38	3.12	2.08	2.23	2.05	2.20	.....	2.04
23	5.60	3.98	4.55	3.54	3.14	3.06	2.05	2.19	2.04	2.23	.....	2.16
24	5.27	3.70	4.44	3.64	2.94	3.00	2.02	2.14	2.06	2.30	.....	2.76
25	4.50	3.60	4.94	3.62	2.84	2.94	2.06	2.13	2.12	2.28	.....	.....
26	3.70	3.50	5.44	3.58	2.82	2.88	2.09	2.10	2.14	2.30	.....	2.86
27	3.52	3.52	5.02	5.10	2.72	2.78	2.10	2.10	2.14	2.28	.....	2.47
28	3.50	4.50	4.42	4.37	2.64	2.64	2.08	2.04	2.16	2.24	.....	2.62
29	3.52	.....	4.22	3.70	2.60	2.58	2.10	2.04	2.13	2.22	.....	2.58
30	3.41	.....	4.14	3.44	2.58	2.54	2.12	2.03	2.12	2.34	.....	2.64
31	3.50	.....	4.09	.....	2.63	.....	.....	2.02	.....	2.40	.....	2.59

NOTE.—Gage heights at this station may be somewhat in error as a result of mill control at Milford, about 8 or 10 miles upstream.

Ice existed from Jan. 1 to 21 and from about Feb. 7 to 27. There was probably little or no backwater from ice during December. Gage heights probably to water surface.

Daily discharge, in second-feet, of Souhegan River at Merrimac, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	43	333	3,750	752	467	121	85	39	21	32	61	68
2	44	298	2,960	722	438	118	81	48	21	47	60	68
3	43	290	1,920	664	387	121	72	42	21	54	66	52
4	40	269	1,340	457	400	115	56	29	24	29	79	50
5	40	230	960	364	409	108	55	42	28	32	98	23
6	40	212	1,260	342	405	128	50	35	28	30	110	25
7	40	200	1,570	324	373	277	47	34	52	30	94	24
8	40	180	1,550	364	277	246	45	39	64	32	87	30
9	40	180	1,990	351	216	216	50	36	68	32	87	29
10	40	170	1,730	342	286	216	58	64	60	37	77	30
11	40	160	1,570	269	286	311	54	55	66	35	66	30
12	40	150	1,530	277	290	368	52	45	47	49	55	30
13	40	140	1,410	320	246	486	45	54	47	32	52	29
14	40	130	1,040	277	246	400	44	48	29	37	54	27
15	40	120	1,110	257	230	320	42	33	29	33	52	26
16	40	120	1,150	277	216	234	42	37	27	41	60	25
17	40	110	1,130	246	205	230	35	36	27	42	47	27
18	40	100	1,110	238	219	294	30	61	29	32	41	27
19	40	90	1,040	1,040	277	287	30	64	32	34	46	27
20	40	80	1,110	722	257	294	28	64	41	37	52	25
21	45	100	1,180	521	230	288	26	83	39	37	50	24
22	378	300	1,180	481	391	277	27	41	25	37	50	24
23	1,880	200	1,060	467	286	253	24	36	24	41	50	33
24	1,610	150	988	516	208	230	22	32	25	49	50	149
25	1,030	120	1,350	506	174	208	25	31	30	47	50	250

Daily discharge, in second-feet, of Souhegan River at Merrimac, N. H., for 1910—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	546	100	1,740	486	168	187	27	28	32	49	50	181
27	457	200	1,410	1,470	137	155	28	28	32	47	50	77
28	447	1,030	974	940	115	115	27	24	33	42	50	110
29	457	.....	843	546	105	101	28	24	31	39	50	101
30	405	.....	794	419	101	92	30	23	30	54	50	115
31	447	.....	764	.....	113	.....	34	22	.....	64	.....	103

NOTE.—The discharge during the open water periods is based on a well-defined discharge rating curve. Discharge Jan. 1 to 21, Feb. 7 to 27, and Nov. 21 to 30, and Dec. 25 has been estimated from climatologic records and the discharge from near-by drainage basins. They are only approximate.

Discharge Jan. 15, Feb. 13, Mar. 6, July 31, and Nov. 19 interpolated.

Monthly discharge of Souhegan River at Merrimac, N. H., for 1910.

[Drainage area, 168 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,880	[a] 40	275	1.64	1.89	B.
February	1,030	[a] 80	206	1.23	1.28	C.
March	3,750	764	1,400	8.33	9.60	B.
April	1,470	238	499	2.97	3.32	A.
May	467	101	263	1.57	1.81	A.
June	486	92	227	1.35	1.51	A.
July	85	22	41.9	.249	.29	A.
August	83	22	41.2	.245	.28	A.
September	68	21	35.4	.211	.24	A.
October	72	29	39.8	.237	.27	A.
November	110	41	61.5	.366	.41	B.
December	[a] 250	23	59.3	.353	.41	B.
The year	3,750	21	264	1.57	21.31	

[a] Estimated.

SOUTH BRANCH OF NASHUA RIVER (WACHUSETT DRAINAGE AREA) AT CLINTON, MASS.

Nashua River is formed by the union of its North and South branches. The North Branch rises in the northern part of Worcester County and flows southeastward about 18 miles; the South Branch rises in the central part of the same county and pursues a circuitous course toward the south, east, and north. From the junction of these branches the Nashua takes a general northerly and easterly course, passing into Middlesex County and thence into New Hampshire, joining the Merrimac at Nashua. For 3 or 4 miles above its mouth the fall of the stream is rapid, its bed is rocky, and its banks are high; above that point its fall is less for a distance of 8 or 10 miles, but the banks are still high enough to confine the river except in high freshets. From Groton to the junction of the branches the stream is very sluggish, its bed and banks are sandy and gravelly, and considerable areas of meadow land bordering the streams are at times inundated.

The South Branch of Nashua River has been measured at Clinton by the engineers of the Metropolitan Water and Sewerage Board since

July, 1896. The results of these measurements have been furnished by Dexter Brackett, chief engineer.

A large reservoir, storing about 8,500,000,000 cubic feet, has been constructed at Clinton, Mass., and water stored since 1903. Beginning with 1897, the estimates have been corrected for gain and loss of storage in reservoirs and mill ponds in the drainage basin, so that the results show the natural flow of the stream.

The yield reported per square mile is the yield of the drainage area, including the water surfaces. In the Wachusett basin this water surface from the years 1897 to 1902, inclusive, amounted to 2.2 per cent of the whole area; in 1903, 2.4 per cent; in 1904, 3.6 per cent; in 1905, 4.1 per cent; in 1906, 5.1 per cent; in 1907, 6 per cent; and in 1908 and subsequent years, 7 per cent.

The accompanying tables give data on discharge and precipitation for 1910, also the average for the years 1897–1910, inclusive, precipitation averages being based on records at several stations in the Nashua drainage basin.

Yield and rainfall in South Branch of Nashua River basin (Wachusett drainage area) at Clinton, Mass., for 1910, and summary for 1897–1910.

[Drainage area, 118.19 square miles.]

Month.	Total yield in million gallons.	Average yield per square mile.		Rainfall in inches.[a]	Rainfall collected.	
		Million gallons per day.	Second-feet.		Inches.[a]	Per cent.
1910.						
January	6,764.1	1.846	2.857	5.86	3.293	56.2
February	6,104.4	1.845	2.854	5.24	2.972	56.7
March	9,670.7	2.640	4.084	1.09	4.709	432.8
April	3,666.2	1.034	1.600	3.01	1.785	59.2
May	2,229.2	.608	.941	2.13	1.085	50.9
June	2,920.3	.824	1.274	4.36	1.422	32.6
July	226.6	.062	.096	1.52	.110	7.2
August	680.9	.186	.288	3.87	.331	8.6
September	513.2	.145	.224	2.86	.250	8.7
October	250.7	.068	.106	1.40	.122	8.7
November	1,256.5	.354	.548	4.17	.612	14.7
December	1,432.5	.391	.605	2.34	.697	29.8
The year	35,715.3	.828	1.281	37.85	17.388	45.9

Summary.

1897–1910.						
January	63,748.3	1.243	1.923	3.80	2.217	58.3
February	69,264.8	1.487	2.301	4.00	2.409	60.2
March	142,929.1	2.786	4.310	4.25	4.970	117.0
April	109,453.1	2.205	3.411	3.98	3.806	95.7
May	61,562.1	1.200	1.857	3.43	2.141	62.3
June	41,814.8	.842	1.303	4.16	1.454	35.0
July	22,639.5	.441	.683	4.22	.787	18.7
August	22,395.1	.437	.675	4.23	.779	18.4
September	19,916.6	.401	.621	3.93	.692	17.6
October	27,509.2	.536	.830	3.34	.957	28.7
November	40,632.7	.819	1.266	3.40	1.413	41.6
December	65,323.9	1.274	1.970	4.34	2.272	52.3
The year	687,189.2	1.137	1.760	47.08	23.897	50.8

[a] For 1910, total for month; 1897–1910, average of totals per calendar month.

SUDBURY RIVER AT FRAMINGHAM AND LAKE COCHITUATE AT COCHITUATE, MASS.

Sudbury River, a small stream of eastern Massachusetts, receives water from an area west of Framingham. It flows thence in a northerly course through meadows and swamps and joins Assabet River to form Concord River, which in turn continues northward, and enters Merrimac River immediately below the city of Lowell. Storage reservoirs have been constructed by the city of Boston and the Metropolitan Water and Sewerage Board, controlling the greater part of the flow from this basin.

Lake Cochituate drains into Sudbury River a short distance below Framingham. It is controlled as a storage reservoir by the Metropolitan waterworks.

Sudbury River and Lake Cochituate have been studied by the engineers of the city of Boston, the State Board of Health of Massachusetts, and the Metropolitan Water and Sewerage Board, and records of rainfall in the Sudbury basin have been kept since 1875, and in the Cochituate basin since 1852, but the latter are considered of doubtful accuracy previous to 1872.

In the Sudbury River basin the water surfaces exposed to evaporation have been increased from time to time by the construction of additional storage reservoirs, as follows: From 1875 to 1878, inclusive, they amounted to 1.9 per cent of the total area; from 1879 to 1884, 3 per cent; 1885 to 1893, 3.4 per cent; 1894 to 1897, 3.9 per cent; 1898 and subsequent years, 6.5 per cent.

The recorded yields of both the Sudbury and Cochituate drainage areas are somewhat affected by the fact that the towns of Framingham, Natick, and Westborough have public water supplies drawn from within the basins, and systems of sewerage discharging outside, and although the quantities diverted are taken into consideration in determining the run-off, the results are probably less accurate since the sewage diversion works were constructed.

The public water and sewerage works were installed in these towns as follows:

Town.	Water supply.	Sewerage works.
Framingham	1885	1889
Natick	1874	1896
Westborough	1879	1892

All the water drawn from the Wachusett drainage area is passed through the reservoirs in the Sudbury basin, and as the measurement of these quantities must be used in determining the yield of the Sudbury basin the unavoidable small percentages of error in the measure-

ment of large quantities of water render less accurate the figures giving yields of the Sudbury water supply during months of low yield for years subsequent to 1897.

The accompanying tables, furnished by Dexter Brackett, chief engineer, give data regarding discharge and precipitation for 1910, also the average for 36 years for Sudbury River and for 48 years for Lake Cochituate.

Yield and rainfall in Sudbury River basin at Framingham, Mass., for 1910, and summary for 1875 to 1910.

[Drainage area, 75.2 square miles.]

Month.	Total yield in million gallons.	Average yield per square mile.		Rainfall in inches.[a]	Rainfall collected.	
		Million gallons per day.	Second-feet.		Inches.[a]	Per cent.
1910.						
January	3,472.6	1.490	2.305	5.39	2.657	49.3
February	3,893.0	1.849	2.861	5.06	2.979	58.9
March	4,555.2	1.954	3.023	.85	3.486	408.7
April	1,504.0	.667	1.031	2.75	1.151	41.9
May	646.5	.277	.429	1.29	.495	38.3
June	1,164.8	.516	.799	4.68	.891	19.0
July	−238.4	− .102	− .158	2.03	− .182	−9.0
August	−169.5	− .073	− .113	2.62	− .130	−5.0
September	11.1	.005	.008	2.49	.008	.3
October	−118.2	− .051	− .078	1.86	− .091	−4.9
November	397.7	.176	.273	4.13	.304	7.4
December	515.9	.221	.342	2.49	.395	15.8
The year	15,634.7	.570	.881	35.64	11.963	33.6

Summary.

1875–1910.						
January	103,039.9	1.228	1.899	4.17	2.190	52.5
February	134,774.1	1.764	2.729	4.25	2.865	67.5
March	238,018.1	2.836	4.387	4.39	5.059	115.2
April	162,829.2	2.005	3.102	3.51	3.461	98.5
May	90,480.9	1.078	1.668	3.34	1.923	57.6
June	41,836.7	.515	.797	3.15	.889	28.2
July	14,321.0	.171	.264	3.56	.304	8.5
August	20,745.6	.247	.382	3.85	.441	11.5
September	20,355.0	.251	.388	3.52	.433	12.3
October	38,063.4	.454	.702	3.93	.809	20.6
November	65,747.0	.810	1.253	3.83	1.398	36.4
December	85,481.9	1.019	1.576	3.81	1.817	47.7
The year	1,015,692.8	1.027	1.589	45.31	21.589	47.6

[a] For 1910, total for month; 1875–1910, average of totals per calendar month.

Yield and rainfall in Lake Cochituate basin at Cochituate, Mass., for 1910, and summary for 1863–1910.

[Drainage area, 17.8 square miles.]

Month.	Total yield, in million gallons.	Average yield per square mile.		Rainfall, in inches.[a]	Rainfall collected.	
		Million gallons per day.	Second-feet.		Inches.[a]	Per cent.
1910.						
January	864.4	1.567	2.424	5.11	2.80	54.7
February	904.1	1.814	2.807	5.16	2.92	56.7
March	860.1	1.559	2.412	.77	2.78	361.1
April	395.8	.741	1.147	2.71	1.28	47.2
May	215.0	.390	.603	1.33	.70	52.3
June	353.4	.662	1.024	4.51	1.14	25.3
July	89.7	.163	.252	2.23	.29	13.0
August	4.8	.009	.013	1.58	.02	1.0
September	34.8	.065	.101	2.50	.11	4.5
October	12.5	.023	.035	1.80	.04	2.2
November	130.7	.245	.379	4.16	.42	10.2
December	180.6	.327	.506	2.61	.58	22.4
The year	4,045.9	.623	.964	34.47	13.08	37.9
Summary.						
1863–1910.						
January	29,600.1	1.118	1.729	3.95	1.99	50.5
February	37,449.0	1.552	2.402	3.98	2.52	63.3
March	57,366.6	2.166	3.351	4.31	3.86	89.6
April	42,848.4	1.671	2.586	3.61	2.89	79.9
May	25,359.5	.957	1.481	3.64	1.71	46.9
June	11,962.0	.467	.722	3.06	.81	26.4
July	7,486.1	.283	.437	3.94	.50	12.8
August	10,569.2	.399	.617	4.17	.71	17.1
September	10,759.8	.420	.649	3.59	.73	20.2
October	14,446.8	.546	.844	4.14	.97	23.5
November	20,048.8	.782	1.210	4.04	1.35	33.8
December	24,466.7	.924	1.429	3.56	1.65	46.3
The year	292,363.0	.937	1.450	45.99	19.69	42.8

[a] For 1910, total for month; 1863–1910, average of totals per calendar month.

TAUNTON RIVER.

GENERAL FEATURES OF AREA DRAINED.

The headwaters of Taunton River rise in the swamps and small ponds of Plymouth and Bristol counties, in the eastern part of Massachusetts. The main river is formed in the eastern part of the township of Bridgewater by the union of Matfield and Town rivers.

Matfield River rises near Holbrook and flows in a general southerly direction, receiving the drainage of several swamps and ponds in its course. Near East Bridgewater it is joined by Beaver Brook, which rises in the townships of Whitman and Abington, and near Elmwood it receives Satucket River, which drains several large swamps and ponds of East Bridgewater, Whitman, Abington, Halifax, and Hanson. The river then flows in a generally southeasterly course to its junction with Town River. Town River rises in Stoughton and Easton, flows southward into a swamp of about 7,000 acres, known

as Great Cedar Swamp, and from this natural reservoir passes eastward through Bridgewater to its junction with Matfield River at Paper Mill village.

The principal tributaries of Taunton River are Wenatuxet, Namasket, Mill, and Threemile rivers, the last two entering below tidewater. Wenatuxet River rises in several small ponds in Plympton and Carver and flows in a general westerly course, receiving Raven Brook and Bartletts Brook from the south. Namasket River enters the Taunton near Titicut. In its drainage area are Assawompsett and Long ponds. Mill River rises in Foxboro, Mansfield, and Easton, flows southward into Great Cedar Swamp, and joins the Taunton in the city of Taunton. Threemile River rises in Foxboro and flows southeastward, joining the Taunton at North Dighton. The Taunton is tidal up to East Taunton, where there is about 2½ feet of rise and fall, and it is navigable to Weir Village.

On account of the large number of small ponds and swamps in the area the run-off through the year is fairly uniform, except in the Matfield drainage basin. There are several power plants on the main river and on the branches.

The average rainfall in this region is about 46 inches. On account of the proximity of this basin to the ocean the winters are not severe.

The country as a whole is very flat, swamps are numerous, and not much rock is found. The western portion of the drainage area is clay bottom and the eastern is sandy but fairly fertile. Nearly all the timber has been removed.

MATFIELD RIVER AT ELMWOOD, MASS.

This station, which is located at the stone arch bridge at Bedford Street, near the village of Elmwood, in the southern part of the town of East Bridgewater, was established September 29, 1909, in cooperation with the State of Massachusetts, for the purpose of determining the amount of water available for a canal (surveys for which have been made by the United States Army engineers) and to aid in an inquiry as to the pollution of Taunton River by sewage. It was discontinued July 10, 1910.

Above the station is a small unused mill dam. Below, at Paper Mill village, Bridgewater, there is a dam which materially affects the flow at times by creating backwater. In using the records from this station for any day it is necessary to take account of the conditions at this dam.

A staff gage is set in the river about 30 feet above the bridge and a chain gage is located on the bridge.

Measurements are made at medium and high water from the bridge and at low water by wading. During ordinary winters ice does not affect the flow. A fairly good rating curve has been developed, but

there is great uncertainty regarding the time and the percentage effect of the backwater from the mill below the station.

Accurate computation of daily and monthly discharge has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date of its discontinuance. The gage heights for 1910 are withheld pending this investigation, since the gage heights recorded at this station are not always true indices of the daily discharge.

Discharge measurements of Matfield River at Elmwood, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 7	P. M. Churchill	30.5	128	4.98	324
22	do	30.5	158	5.90	642
Feb. 15	Bartlett and Stanford	30	57	2.83	70
15	do	28	54	2.79	66
19	P. M. Churchill	30.5	129	4.90	328
Mar. 5	L. W. Bartlett	26.5	109	4.72	236

SATUCKET RIVER NEAR ELMWOOD, MASS.

This station, which is located at a bridge owned by the Carver Cotton Gin Co., about 200 feet downstream from their dam, was established September 29, 1909, in cooperation with the State of Massachusetts, and was discontinued July 10, 1910. In conjunction with the station on the Matfield, records were obtained for use in the investigation of water supply, water power, and the pollution of the streams in this locality.

Water power is used at this place for a portion of the year. When the wheels are running it is necessary to make special computations of the flow.

On account of the large number of swamps and ponds in this drainage area the flow is more evenly distributed throughout the year than on the Matfield.

A staff gage was at first used at this station. This gage was soon replaced by a chain gage, which was set at a different datum. Discharge measurements were made from the bridge on which the gage is placed, and at low water by wading below the station. Ice does not usually interfere with the flow.

The plotting of the discharge measurements indicates variable backwater at this station. Gage heights are affected by the operation of the mill above, and at times the flow is affected by grass in the channel.

Accurate computation of the diurnal fluctuation of discharge due to these causes has been rendered impossible by insufficient funds.

It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date of its discontinuance. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indices of the daily discharge.

Discharge measurements of Satucket River near Elmwood, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 7	P. M. Churchill	26	98.2	4.54	168
22	do	30	141	5.75	291
Feb. 9	do	26	88.4	4.09	155
15	T. W. Norcross	27	30.6	[a] 2.01	36.0
15	W. S. Stanford	27	56.2	[a] 2.96	98.9
15	L. W. Bartlett	27	55.9	[a] 3.00	98.1
15	W. S. Stanford	26.5	54.4	[a] 2.90	105
19	P. M. Churchill	26	88	4.09	155
Mar. 5	Bartlett and Stanford	30	115	4.88	220
8	P. M. Churchill	29	102	4.63	191
16	do	26	62.3	2.99	92.3
17	Bartlett and Stanford	26	60.8	3.08	123
26	do	24	26.2	[a] 1.67	59.5
May 7	do	25	16.2	1.35	35.1
7	do	25	17.6	1.35	38.9

[a] Gage height fluctuating during measurement.

BLACKSTONE RIVER.

GENERAL FEATURES OF AREA DRAINED.

Blackstone River rises in Worcester County, near the city of Worcester, Mass., where it is formed by the run-off from several ponds. It flows in a general southeasterly direction, receiving from the west Singleton Brook, Cold Spring Brook, Mumford River, and Branch River, and from the east Quinsigamond River (the outlet of Quinsigamond Lake), West River, Mill River, and Abbot River, and empties into Seekonk River, the head of Narragansett Bay, below Pawtucket, R. I.

The Blackstone has always been important as a water-power stream and has been very fully utilized. The basin contains no large lakes, but its many small ponds and reservoirs are used for storage. The flow of the river is thus made fairly constant. The tributaries, though small, are also well developed for power.

The average rainfall on this drainage basin is about 45 inches.

BRANCH RIVER AT BRANCH VILLAGE, R. I.

Branch River rises near the western boundary of the State of Rhode Island, flows easterly and northeasterly through several small ponds, and receives the drainage from other ponds and swamps, and enters Blackstone River near Blackstone, Mass.

The gaging station, which is located at Branch village just below the mill of James Pitts & Son, three-fourths mile from Forestdale and about 2 miles from Woonsocket, was established September 2, 1909, in cooperation with the State of Rhode Island in its survey of the natural resources of the State.

A staff gage is bolted to a ledge outcrop about 500 feet below the dam and mill. A chain gage is attached to a tree on top of the ledge. All gage heights refer to the staff gage.

Discharge measurements are made by wading at low and medium stages and from the bridge above the dam or from a boat at high stages.

The conditions are fairly favorable for accurate measurements. The gage heights are affected by the mill control directly above the station and by similar control farther up the river. The storage above the Pitts mill is small, and water goes over the dam for a large portion of the time. During the winter ice affects the flow only in severe weather.

A fairly good discharge rating curve has been developed.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Discharge measurements of Branch River at Branch Village, R. I., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 4	C. A. Moore	77	444	3.03	480
4	do	77	441	2.96	434
4	do	77	464	3.03	486
4	do	77	467	[a] 3.05	500
4	do	77	466	3.04	513

[a] Gage height fluctuating.

NOTE.—All measurements made from highway bridge above dam.

WOONASQUATUCKET RIVER.

GENERAL FEATURES OF AREA DRAINED.

Woonasquatucket River, which is fed from the run-off of several ponds and reservoirs and lies wholly in the State of Rhode Island, is formed by the junction of two small branches. The northern branch, rising in North Smithfield, flows southward, uniting with

the southern branch at Stillwater, in Smithfield, and the latter branch, rising in Gloucester, flows south, east, then north to its junction with the main stream. From this point the river flows in a general southeasterly direction, emptying into Providence River at the head of Narragansett Bay.

WOONASQUATUCKET RIVER AT OLNEYVILLE, R. I.

This station is located at the dam in Olneyville, near Providence, R. I., in the yards of the Atlantic Mills. It is maintained in cooperation with the Atlantic Mills Co., by whom the observations are taken, and was established March 16, 1910.

The staff gage is bolted to the right abutment of the dam of the company. There is also an auxiliary staff gage nailed to a tree on the right bank in the rips about one-half mile above the dam.

No measurements have been made during 1910. The water is not used for power development at the Atlantic Mills but there is more or less diversion of water for engine boilers and industrial purposes. It is not known whether mills farther up on the river affect the accuracy of the daily gage heights.

Daily gage height, in feet, of Woonasquatucket River at Olneyville, R. I., for 1910.

[H. R. Westcott, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.25	.....	5.18	4.98	5.00	5.02	.....	5.00	5.00
2	.....	4.75	5.22	5.16	5.00	5.10	5.00	.....	5.00	4.90
3	.....	.....	5.26	5.20	.....	5.00	5.00	5.00	5.10	5.00
4	.....	5.15	5.27	5.20	.....	4.90	.....	5.10	4.90	.....
5	.....	5.08	5.24	.....	4.80	5.00	5.10	4.92	5.00	5.10
6	.....	5.10	5.19	5.20	.....	5.00	5.10	4.94	.....	5.10
7	.....	4.99	5.20	5.24	5.00	.....	5.10	5.00	4.90	5.00
8	.....	5.13	.....	5.20	5.20	5.10	5.18	5.00	5.00	5.10
9	.....	5.00	5.14	5.14	5.10	4.55	5.10	.....	5.00	5.10
10	.....	.....	5.26	5.20	.....	5.15	5.00	4.70	4.90	5.10
11	.....	5.20	5.29	5.10	5.10	5.10	.....	.....	5.00	.....
12	.....	5.10	5.24	.....	4.90	5.00	5.20	5.20	5.10	5.10
13	.....	5.12	5.25	5.20	5.00	5.00	5.08	4.90	.....	5.10
14	.....	5.20	5.00	5.32	5.15	.....	5.10	5.00	5.00	5.00
15	.....	5.22	.....	5.10	5.10	5.06	5.12	5.00	5.00	5.00
16	5.25	5.10	5.18	5.22	5.10	5.10	5.00	.....	5.10	5.10
17	5.36	.....	5.22	5.30	.....	5.09	5.00	5.00	5.00	5.10
18	5.36	5.15	5.28	5.20	5.15	5.04	.....	5.10	4.90	.....
19	5.30	5.26	4.95	.....	5.09	5.15	5.10	5.00	5.00	5.00
20	.....	5.20	5.01	5.18	5.04	5.00	4.72	4.90	.....	5.00
21	5.39	5.21	5.00	5.12	4.55	.....	5.10	5.00	5.00	5.10
22	5.26	5.16	.....	5.19	4.60	5.00	5.00	4.90	5.10	4.90
23	5.10	5.10	5.05	5.20	5.10	5.00	5.02	.....	5.00	4.90
24	5.29	.....	5.15	5.20	.....	4.90	5.00	5.00	.....	5.00
25	5.33	5.16	5.10	5.00	5.15	5.10	.....	4.90	5.00	.....
26	5.35	5.26	5.20	.....	5.05	5.00	4.79	5.00	5.10	.....
27	.....	5.34	5.20	5.05	4.45	5.00	5.00	5.00	.....	4.90
28	5.07	5.26	5.10	5.14	4.96	.....	5.02	5.00	5.00	5.00
29	5.12	5.15	.....	5.10	4.66	5.14	5.04	5.00	5.10	5.00
30	5.11	5.15	.....	5.14	5.10	5.10	5.00	.....	5.00	5.10
31	5.22	.....	5.08	.....	.....	.....	.....	4.80	.....	5.00

NOTE.—No information regarding presence of ice is available.

PAWTUXET RIVER BASIN.

GENERAL FEATURES OF AREA DRAINED.

Pawtuxet River is formed near Richmond, R. I., by the union of Ponagansett and Moswansicut rivers. Ponagansett River rises in Ponagansett reservoir, in the town of Foster, R. I., and flows in a general southeasterly direction, receiving the drainage from several small ponds and swamps. Moswansicut River rises in a pond of the same name near North Scituate, R. I., and flows southward, receiving near its source several small brooks coming from the northwest. Pine Swamp reservoir and Quonopaug Brook also drain into this river. Below the junction of the two branches the river flows to the east and south to Riverpoint, where it is joined by the southwest branch of Pawtuxet River. This river drains a region of ponds and swamps, the largest of which is Flat River reservoir.

The Pawtuxet then flows to the northeast, receiving the Pocasset River from the north, and enters Narragansett Bay at Pawtuxet.

PAWTUXET RIVER AT HARRIS, R. I.

This station, which is located at the highway bridge near the Harris railroad station, was established August 12, 1909, and is maintained in cooperation with Natural Resources Survey of the State of Rhode Island.

The station is located between two mills, each about 2,000 feet distant. When the lower mill is not running backwater exists at the bridge. The rating curve is applicable for periods when both mills are running. When both are stopped the rating curve is applicable only for periods when the water is flowing over the lower dam.

The flow through the wheels at the mill above the station does not vary materially through the day except at times of extreme low water, when the amount of water is insufficient to run the mill for the entire day. Except for the difficulties caused by the mills the conditions for obtaining accurate discharge data are good. Careful observations of the many important conditions are made by the observer.

Discharge measurements are made from the highway bridge, where the conditions are good.

No change has been made in the datum of the chain gage located on the bridge.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage

heights for 1910 are withheld pending this investigation, since the gage heights recorded at this station are not always true indexes of the daily discharge.

Discharge measurements of Pawtuxet River at Harris, R. I., in 1910.

Date.		Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.			*Feet.*	*Sq.ft.*	*Feet.*	*Sec.-ft.*
Mar.	2[a]	C. A. Moore	75.5	271	3.72	1,060
	2[a]	do	75.5	271	3.67	1,030
	3	do	75.5	244	3.36	802
	3	do	75.5	237	3.25	709
	3	do	75.5	227	3.08	631
	3	do	75.5	241	3.29	701
	3[a]	do	75.5	234	3.22	704
	3	do	75.5	229	3.14	611
	8	do	75.5	196	2.68	384
	8	do	75.5	203	2.77	433
	8	do	75.5	192	2.64	382

[a] Subsurface velocity, coefficient used 0.90.

PAWCATUCK RIVER BASIN.

GENERAL FEATURES OF AREA DRAINED.

Pawcatuck River is formed near Wood River Junction, R. I., by the union of Wood and Charles rivers. Wood River rises in swampy land in Sterling, Conn., flows generally southeast to Mount Tom, R. I., where it is joined by Flat River, which rises in swamps at West Greenwich, R. I. Wood River then flows southward to its junction with Charles River. The Charles is formed by the outflow from Great Swamp and from Wordens Pond, flows westward, and receives the drainage of several small swamps and ponds. The Pawcatuck follows a winding course, in general westerly for about 8 miles, then turns to the south, and enters the ocean at Little Narragansett Bay.

The slope of the river is in general small, but several of the small power sites on Wood River are undeveloped. The natural storage on this drainage is good.

WOOD RIVER AT HOPE VALLEY, R. I.

This station, which is located just below the dam of the Taylor Manufacturing Co. and about half a mile below Hope Valley, was established August 13, 1909, in cooperation with the State of Rhode Island.

The low-water portion of the staff gage is bolted to a bowlder in the middle of the river a little below the outlet of the tailraces. The high-water portion is on the left bank nearly opposite the low-water portion. At low and moderately low water measurements are made by wading about one-fourth mile downstream, where the conditions are favorable for obtaining accurate measurements. At medium and

high stages measurements must be made from the highway bridge just above the gage and from the bridge over the tailrace. The flow during the day is rather uniform, except as governed by the wheels at the Taylor plant.

The datum at the gage has remained the same during the maintenance of the station. During the winter months the discharge is somewhat affected by ice. A good discharge rating curve has been developed.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Discharge measurements of Wood River at Hope Valley, R. I., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 5	C. A. Moore	49	89.6	1.90	257
5	do	49	89.6	1.91	265
5	do	49	89.6	1.91	254
5	do	49	89.6	1.90	266

CONNECTICUT RIVER.

GENERAL FEATURES OF AREA DRAINED.

Connecticut River rises in the Connecticut Lakes in northern New Hampshire, flows in a southerly direction between New Hampshire and Vermont and across Massachusetts and Connecticut to Long Island Sound. It is the largest river in New England except the St. John, is about 345 miles long, and drains an area of 11,085 square miles, of which about 155 square miles lie in the Province of Quebec.

The river has many important tributaries, among which are Passumpsic, Ammonoosuc, Wells, White, Mascoma, Ottaqueechee, Sugar, West, and Ashuelot rivers, which join north of the Massachusetts line; Millers, Deerfield, Chicopee, and Westfield rivers, which enter in the State of Massachusetts; and Farmington River, which enters near Hartford, Conn.

From its headwaters in the Connecticut Lakes to Long Island Sound the Connecticut falls about 1,900 feet. The upper portions of the drainage area are rugged and the surface of the country is broken by

undulating ridges, here and there rising to mountain height, and is for the most part forested. In central and southern New Hampshire and Vermont the country is hilly and most of the tributary streams have a good fall, but more of the area is in cultivation. Deerfield and Westfield rivers, rising in the Berkshires, in Massachusetts, are quick-spilling streams, with steep slopes and narrow valleys, largely wooded; Millers and Chicopee rivers on the east drain a flatter country with numerous ponds and reservoirs. In Connecticut the river valley is generally broad and the country rolling, its soil is very fertile, and it is an important farming district.

The rocks are in general granite, gneiss, mica slate, and mica schists. An exception to this is the red sandstone in the Connecticut Valley, extending from New Haven nearly to the northern boundary of Massachusetts. The prevailing surface material is glacial drift.

The mean annual precipitation in the Connecticut Valley is about 40 inches, ranging from about 47 inches at Hartford to probably about 35 inches in the extreme upper portions. In a general way, there is usually a difference of a month in the time of beginning of the spring season in the lower portion of the river and its headwaters, and this tends to diminish the severity of floods from melting snow and equalize the spring run-off. The range in winter conditions is also somewhat variable, the lower courses of the river being subject usually to several thaws, while the upper third of the river usually remains frozen throughout the winter. Snow accumulates to considerable depths. The river is navigable to Hartford and, by smaller boats, as far as Holyoke.

The natural facilities for storage on Connecticut River are perhaps less than on many of the New England rivers, although on Millers, Chicopee, and Farmington rivers some storage has been developed. There are, however, many localities in this basin where reservoirs could be constructed, and there is need of systematic effort in this direction as the low-water flow on the Connecticut could be much improved by utilizing some of these storage sites, especially in the upper portions of the basin. Sunapee Lake, tributary to the Connecticut through Sugar River, is 6.5 square miles in area and can be drawn down 60 inches.

The Connecticut and its tributaries are very important for water power. On the main river large power plants are in operation at Wilder, Bellows Falls, Turners Falls, and Holyoke. In 1909 a hydroelectric power station on the Connecticut at Hinsdale, N. H., was completed. This plant furnishes power for Fitchburg and Worcester. Many power sites in this basin are still undeveloped.

The longest record of flow in the Connecticut is at Holyoke, Mass., and extends back to 1880. This record was interrupted in 1899, but since 1904 the records of the station at Sunderland are available

for purposes of comparison. The driest year during the period covered by these records was 1883, and the wettest 1888, the total flow during these two years being about in the ratio of 1 to 2.14.

CONNECTICUT RIVER AT ORFORD, N. H.

This station, which is located at the wooden highway bridge between Orford, N. H., and Fairlee, Vt., was established August 6, 1900, to obtain information regarding the daily distribution of flow of the upper Connecticut River. Several small streams enter the Connecticut near Orford, but the only one of any considerable size is Waits River, approximately 10 miles above the station. The nearest dam is at Wilder, about 18 miles downstream. Backwater from this dam reaches probably within a few miles of Orford. Upstream the nearest dam is at East Ryegate, Vt., about 20 miles distant.

The chain gage is attached to the bridge, from which discharge measurements are made. Its datum has remained the same during the maintenance of the station.

During the winter months the discharge is affected by ice, but numerous discharge measurements under ice cover have been made, and fairly good rating curves have been developed for these conditions.

Conditions for obtaining accurate discharge data during the open season are fairly good, and a good discharge rating curve has been developed for 1910. This curve is a revision of the 1909 curve for high stages, deduced from later measurements and vertical velocity curve measurements. It is also different at low stages, owing to probable change in conditions of flow.

Discharge measurements of Connecticut River at Orford, N. H., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 29	T. W. Norcross	317	4,710	15.38	17,000
Aug. 17	G. M. Brett	278	1,860	5.99	3,280

Daily gage height, in feet, of Connecticut River at Orford, N. H., for 1910.

[F. H. Gardner, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.0	8.9	.....	18.5	11.1	10.3	5.2	4.6	3.1	6.0	5.6	4.6
2	3.9	8.5	14.2	18.95	11.3	10.4	5.0	4.2	3.1	5.5	5.4	4.4
3	3.9	8.5	17.5	18.8	11.2	12.0	4.7	4.1	3.1	5.5	5.2	4.2
4	3.8	8.1	16.9	17.25	11.1	14.0	4.5	4.65	3.3	5.1	5.4	4.2
5	3.7	7.0	15.6	15.9	11.0	10.1	4.5	8.5	3.1	5.7	6.2	4.0
6	3.8	6.5	15.7	15.0	14.5	9.3	4.4	8.3	4.8	5.5	5.5	4.1
7	4.0	.....	16.3	16.85	13.4	9.3	4.8	6.9	5.8	5.2	6.8	4.0
8	4.0	.....	15.2	18.3	11.1	9.2	4.4	6.1	5.5	5.0	6.5	4.0
9	4.1	.....	14.4	18.35	11.1	10.0	4.0	5.2	5.4	4.9	6.4	4.1
10	4.2	.....	13.2	17.6	10.2	9.7	4.0	5.1	4.7	4.7	6.4	4.0

Daily gage height, in feet, of Connecticut River at Orford, N. H., in 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	4.2	.....	12.0	15.3	10.8	9.4	3.6	5.0	4.6	4.3	5.9	3.9
12	4.2	.....	11.0	12.9	10.5	9.0	4.1	4.9	4.6	4.5	5.4	.....
13	4.1	5.8	10.8	11.5	9.8	8.8	3.9	4.7	4.5	4.3	5.3	.....
14	4.0	.....	10.3	10.5	9.1	8.4	4.2	4.6	4.3	4.2	5.1	.....
15	4.0	.....	10.0	9.6	8.6	7.8	5.1	4.4	4.9	3.9	5.0	.....
16	4.1	.....	9.6	9.5	8.4	7.7	3.7	5.1	4.9	3.4	5.0	.....
17	.....	.....	8.9	9.3	8.0	7.3	3.8	5.5	4.3	3.6	4.9	.....
18	.....	.....	8.2	9.0	7.5	7.0	3.7	5.9	4.2	3.8	4.9	4.1
19	.....	.....	8.0	8.8	7.7	7.7	3.8	5.3	3.9	4.0	4.8	.....
20	.....	5.9	7.8	9.9	8.4	8.0	3.5	5.5	3.7	4.1	4.8	.....
21	.....	.....	8.4	11.0	8.9	7.2	3.1	5.7	3.6	4.0	4.5	.....
22	.....	.....	9.0	11.4	8.5	7.1	3.4	4.7	2.8	3.4	4.0	.....
23	14.2	.....	9.5	12.2	7.9	7.0	3.3	4.6	2.8	3.2	4.1	.....
24	13.8	.....	10.0	14.8	7.7	6.3	3.5	4.6	2.6	3.8	4.4	.....
25	13.0	.....	9.9	13.2	8.5	6.0	4.0	4.7	3.3	4.0	4.3	5.3
26	13.0	.....	16.0	11.8	8.5	5.6	4.1	4.2	3.8	4.2	4.2	.....
27	.....	6.8	16.85	11.9	14.5	5.4	3.9	3.6	3.0	5.5	4.6	.....
28	12.6	.....	15.85	14.8	15.5	5.4	3.9	3.5	3.5	4.9	4.6	.....
29	11.0	.....	15.45	13.5	14.1	5.4	3.9	3.4	6.4	5.0	4.5	.....
30	10.5	.....	15.9	11.5	11.7	5.2	3.7	3.3	6.2	5.4	4.6	.....
31	9.1	.....	17.5	.....	11.6	.....	4.5	3.3	.....	5.5	.....	.....

NOTE.—Ice existed at this station from Jan. 1 to Mar. 1 and from Dec. 6 to 31. Gage readings were to water surface except Jan. 1 to Feb. 6 and Dec. 6 to 11, which were to the top of the ice. The thickness of ice varied during January and February between 0.7 foot and 1.4 feet. During December it attained a thickness of about 0.8 foot.

Daily discharge, in second-feet, of Connecticut River at Orford, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,000	4,000	8,000	23,600	9,920	8,740	2,520	2,000	1,000	3,290	2,900	2,000
2	1,000	3,500	15,200	24,500	10,200	8,880	2,340	1,690	1,000	2,800	2,700	1,840
3	1,000	3,500	21,500	24,200	10,100	11,300	2,080	1,620	1,000	2,800	2,520	1,690
4	900	3,000	20,300	21,000	9,920	14,800	1,920	2,040	1,110	2,430	2,700	1,690
5	900	2,500	17,800	18,400	9,770	8,450	1,920	6,230	1,000	2,990	3,500	1,550
6	900	2,000	18,000	16,600	15,700	7,320	1,840	5,960	2,170	2,800	2,800	1,300
7	900	2,000	19,100	20,200	13,700	7,320	2,170	4,260	3,090	2,520	4,150	1,200
8	900	2,000	17,000	23,200	9,920	7,180	1,840	3,400	2,800	2,340	3,820	1,200
9	1,000	2,000	15,500	23,300	9,920	8,300	1,550	2,520	2,700	2,260	3,710	1,100
10	1,000	1,500	13,300	21,700	8,600	7,880	1,550	2,430	2,080	2,080	3,710	1,100
11	1,000	1,500	11,300	17,200	9,470	7,460	1,290	2,340	2,000	1,760	3,190	1,000
12	1,000	1,500	9,770	12,800	9,030	6,900	1,620	2,260	2,000	1,920	2,700	1,000
13	1,000	1,500	9,470	10,500	8,020	6,640	1,480	2,080	1,920	1,760	2,610	1,000
14	900	1,500	8,740	9,030	7,040	6,100	1,690	2,000	1,760	1,690	2,430	1,000
15	900	1,500	8,300	7,740	6,360	5,320	2,430	1,840	2,260	1,480	2,340	1,000
16	900	1,500	7,740	7,600	6,100	5,200	1,350	2,430	2,260	1,170	2,340	1,000
17	1,000	1,400	6,770	7,320	5,580	4,720	1,420	2,800	1,760	1,290	2,260	1,000
18	1,200	1,400	5,840	6,900	4,960	4,380	1,350	3,190	1,690	1,420	2,260	1,000
19	1,500	1,400	5,580	6,640	5,200	5,200	1,420	2,610	1,480	1,550	2,170	1,000
20	2,000	1,400	5,320	8,160	6,100	5,580	1,230	2,800	1,350	1,620	2,170	1,200
21	3,000	1,400	6,100	9,770	6,770	4,610	1,000	2,990	1,290	1,550	1,920	1,400
22	6,000	1,500	6,900	10,400	6,230	4,500	1,170	2,080	850	1,170	1,550	1,600
23	12,000	1,500	7,600	11,600	5,450	4,380	1,110	2,000	850	1,060	1,620	1,600
24	10,000	1,500	8,300	16,300	5,200	3,600	1,230	2,000	755	1,420	1,840	1,800
25	8,000	1,600	8,160	13,300	6,230	3,290	1,550	2,080	1,110	1,550	1,760	1,800
26	8,000	1,800	18,500	11,000	6,230	2,900	1,620	1,690	1,420	1,690	1,690	1,800
27	7,000	2,000	20,200	11,200	15,700	2,700	1,480	1,290	950	2,800	2,000	2,000
28	7,000	4,000	18,200	16,300	17,600	2,700	1,480	1,230	1,230	2,260	2,000	2,000
29	6,000	.....	17,500	13,900	15,000	2,700	1,480	1,170	3,710	2,340	1,920	2,400
30	5,000	.....	18,400	10,500	10,800	2,520	1,350	1,110	3,500	2,700	2,000	2,800
31	4,000	.....	21,500	.....	10,700	.....	1,920	1,110	.....	2,800	.....	3,000

NOTE.—Daily discharge for open channel determined from a well-defined discharge rating curve. Discharge for the periods during which ice was present, Jan. 1 to Mar. 1 and Dec. 6 to 31, are only approximate and are obtained from approximate ice discharge rating curves developed in earlier years from climatologic records and observers' notes. No measurements were made during 1910 with ice present, but earlier measurements indicate that conditions are about the same each year.

Monthly discharge of Connecticut River at Orford, N. H., for 1910.

[Drainage area, 3,300 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	12,000	900	3,130	0.948	1.09	C.
February	4,000	1,400	2,000	.606	.63	C.
March	21,500	5,320	12,800	3.88	4.47	A.
April	24,500	6,640	14,500	4.39	4.90	A.
May	17,600	4,960	9,080	2.75	3.17	A.
June	14,800	2,520	6,050	1.83	2.04	A.
July	2,520	1,000	1,630	.494	.57	A.
August	6,230	1,110	2,430	.736	.85	A.
September	3,710	755	1,740	.527	.59	A.
October	3,290	1,060	2,040	.618	.71	A.
November	4,150	1,550	2,510	.761	.85	A.
December	3,000	1,000	1,520	.461	.53	C.
The year	24,500	755	4,960	1.50	20.40	

CONNECTICUT RIVER AT SUNDERLAND, MASS.

This station, which is located at a five-span steel highway bridge at Sunderland, about 18 miles in an air line above the Holyoke dam and 10 miles in an air line below that at Turners Falls, was established March 31, 1904, to obtain information regarding the daily distribution of flow of the river.

A record of flow of the Connecticut at Holyoke was carried on from 1880 to 1899, but interrupted after that time, and as this station has practically the same drainage area, it is of especial value in continuing the Holyoke records, which have been very widely used in power, storage, and navigation studies both on the Connecticut and on streams of similar regimen.

Deerfield River enters the Connecticut a short distance below Turners Falls.

The chain gage attached to the bridge is read twice daily. Its datum has remained the same during the maintenance of the station. Discharge measurements are made from the bridge. During the winter months the discharge is affected by ice. Conditions for obtaining accurate discharge data are fairly good, although there have been some changes in the condition of the bed of the river requiring changes in the rating curve. A fairly good discharge rating curve has been developed for 1910.

Discharge measurements of Connecticut River at Sunderland, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 15[a]	D. M. Wood	.....	.....	5.86	5,580
Mar. 9	do	776	10,800	14.55	41,700
Sept. 15	W. G. Hoyt	633	2,640	3.26	4,230

[a] Ice 0.5 to 0.7 foot thick was present.

Daily gage height, in feet, of Connecticut River at Sunderland, Mass., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.90	6.30	21.20	17.20	9.98	8.32	4.05	1.88	2.15	3.75	3.48	3.02
2	.....	6.10	25.35	17.05	7.60	8.28	3.90	2.55	2.20	3.92	3.48	3.25
3	.....	6.05	23.65	16.45	8.90	8.50	3.42	2.70	2.25	3.60	3.58	3.15
4	.....	6.30	21.25	14.72	9.15	8.25	3.30	2.62	1.45	3.42	3.95	2.20
5	.....	5.90	18.25	14.30	9.78	7.75	3.30	2.90	1.08	3.45	4.35	2.10
6	.....	5.95	15.62	13.60	10.52	8.18	3.48	5.98	1.82	3.35	5.60	3.45
7	.....	6.25	14.65	13.00	10.50	9.15	3.25	5.50	3.00	3.35	5.38	4.95
8	5.15	5.75	15.45	13.25	9.60	9.42	3.18	4.65	3.20	3.40	5.15	4.35
9	.....	6.10	14.70	13.65	8.92	9.10	2.92	4.25	4.10	2.52	4.95	3.65
10	.....	5.85	12.72	13.80	8.15	8.55	2.70	3.42	3.75	2.25	4.65	3.35
11	.....	5.40	11.40	11.75	8.05	8.25	2.55	3.33	3.05	3.25	4.25	2.55
12	.....	4.90	10.20	11.42	8.02	9.38	3.25	3.40	3.10	3.50	4.00	2.10
13	.....	5.75	9.75	10.05	7.85	9.90	3.20	3.50	3.40	3.40	3.52	2.95
14	.....	6.20	9.95	9.20	7.35	9.00	2.92	3.20	3.35	3.25	2.78	3.00
15	4.50	5.70	9.32	8.35	7.00	7.65	2.65	2.82	3.18	2.85	3.85	3.20
16	.....	.....	8.95	8.30	7.00	7.35	2.55	3.25	3.42	1.65	3.70	3.10
17	.....	.....	8.60	7.28	6.65	7.05	1.88	3.25	3.15	1.50	3.65	3.05
18	.....	6.25	7.90	7.25	6.55	7.32	1.90	3.20	2.28	2.08	3.55	2.40
19	.....	.....	7.60	8.15	6.35	6.80	2.08	3.30	1.95	2.08	3.65	2.15
20	.....	.....	7.45	8.55	6.45	6.88	2.42	3.18	2.70	2.40	2.75	2.92
21	.....	6.30	9.05	8.45	6.45	6.50	2.50	3.10	2.90	2.40	2.90	3.05
22	15.30	.....	10.25	8.30	7.10	5.80	2.55	3.05	2.60	2.25	3.50	3.10
23	18.35	.....	10.60	8.40	5.85	5.42	2.30	3.42	2.65	1.60	3.75	3.10
24	14.12	.....	11.80	8.92	6.48	5.00	1.68	3.20	2.52	1.68	3.40	3.50
25	12.25	8.00	13.05	9.72	6.20	4.65	1.30	3.32	1.70	2.58	2.42	3.00
26	10.70	.....	18.08	10.65	6.40	5.02	2.05	3.28	1.42	2.60	2.65	3.00
27	9.65	.....	18.60	12.50	8.20	3.32	2.32	2.78	1.95	2.55	1.50	3.22
28	8.58	10.60	16.90	12.35	10.15	4.10	2.70	1.75	2.15	2.50	2.02	3.80
29	8.10	.....	16.40	11.78	10.12	3.90	2.55	1.70	2.35	2.95	2.50	4.55
30	7.30	.....	17.18	10.90	9.62	4.25	2.65	2.20	2.25	2.50	2.80	4.90
31	6.25	.....	17.50	.....	8.80	.....	1.95	2.45	.....	2.35	.....	5.45

NOTE.—The relation of gage height to discharge was affected by the presence of ice from Jan. 1 to 21, from Feb. 7 to 28, and from Dec. 6 to 31. Gage heights were taken to water surface, except Jan. 1, 8, and Feb. 7 to 15, and 28, which were taken to the top of the ice. During January the ice thickness varied from 0.2 to 0.9 foot and during February it attained a thickness of 0.7 foot. The ice effect during December was probably entirely backwater.

Daily discharge, in second-feet, of Connecticut River at Sunderland, Mass., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,600	11,600	73,100	54,800	24,400	18,200	5,720	2,060	2,380	5,100	4,550	3,710
2	3,500	11,000	92,200	54,100	15,800	18,100	5,410	2,940	2,450	5,450	4,550	4,120
3	3,400	10,800	84,400	51,400	20,300	18,900	4,440	3,170	2,520	4,790	4,750	3,940
4	3,200	11,600	73,400	43,800	21,200	18,000	4,210	3,050	1,580	4,440	5,520	2,450
5	3,000	10,400	59,600	41,900	23,600	16,300	4,210	3,500	1,210	4,500	6,380	2,320
6	3,200	10,500	47,700	38,900	26,500	17,700	4,550	10,600	1,980	4,300	9,470	2,500
7	3,800	9,000	43,500	36,400	26,400	21,200	4,120	9,190	3,670	4,300	8,870	2,500
8	5,000	7,000	47,000	37,400	22,900	22,200	3,990	7,060	4,030	4,400	8,280	2,500
9	6,000	6,000	43,700	39,100	20,400	21,000	3,530	6,160	5,830	2,900	7,780	2,300
10	5,000	5,600	35,200	39,800	17,600	19,000	3,170	4,440	5,100	2,520	7,060	2,200
11	4,500	5,300	29,900	31,300	17,300	18,000	2,940	4,360	3,760	4,120	6,160	2,000
12	4,000	5,000	25,200	30,000	17,200	22,100	4,120	4,400	3,870	4,590	5,620	2,300
13	3,700	5,200	23,500	24,600	16,600	24,100	4,030	4,590	4,400	4,400	4,630	2,500
14	3,500	5,400	24,200	21,400	14,900	20,700	3,530	4,030	4,300	4,120	3,300	2,500
15	3,200	5,580	21,900	18,300	13,800	15,900	3,100	3,360	3,990	3,420	5,300	2,200
16	3,000	5,600	20,500	18,200	13,800	14,900	2,940	4,120	4,440	1,800	4,990	2,200
17	2,800	5,800	19,200	14,700	12,700	13,900	2,060	4,120	3,940	1,630	4,890	2,200
18	5,000	6,000	16,800	14,600	12,300	14,800	2,080	4,030	2,550	2,300	4,690	2,200
19	8,000	6,000	15,800	17,600	11,700	13,100	2,300	4,210	2,140	2,300	4,890	2,000
20	12,000	6,000	15,300	19,000	12,000	13,400	2,750	3,990	3,170	2,720	3,250	2,500
21	20,000	6,000	20,900	18,700	12,000	12,200	2,870	3,870	3,500	2,720	3,500	3,000
22	46,300	6,000	25,400	18,200	14,100	10,000	2,940	3,760	3,020	2,520	4,590	3,000
23	60,000	7,000	26,800	18,500	10,200	8,970	2,580	4,440	3,100	1,740	5,100	3,000
24	41,200	8,000	31,500	20,400	12,100	7,900	1,830	4,030	2,900	1,830	4,400	3,500
25	33,300	10,000	36,600	23,400	11,200	7,060	1,430	4,250	1,850	2,990	2,750	3,500

Daily discharge, in second-feet, of Connecticut River at Sunderland, Mass., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	27,200	12,000	58,800	27,000	11,900	7,950	2,260	4,170	1,550	3,020	3,100	3,500
27	23,100	15,000	61,200	34,300	17,800	4,250	2,610	3,300	2,140	2,940	1,630	3,800
28	19,100	20,000	53,400	33,700	25,000	5,830	3,170	1,900	2,380	2,870	2,220	3,500
29	17,500	.....	51,200	31,400	24,900	5,410	2,940	1,850	2,650	3,580	2,870	3,300
30	14,800	.....	54,700	28,000	23,000	6,160	3,100	2,450	2,520	2,870	3,300	3,000
31	11,400	.....	56,200	.....	19,900	.....	2,140	2,800	.....	2,650	.....	3,000

NOTE.—Daily discharge during the open periods determined from a well-defined discharge rating curve. Discharge for periods during which ice existed estimated from one measurement made Feb. 15, with ice present, from climatologic records, and from a consideration of the discharge of the Connecticut at Orford, Deerfield River at Shelburne Falls, and Chicopee River at Red Bridge.

Monthly discharge of Connecticut River at Sunderland, Mass., for 1910.

[Drainage area, 7,700 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	60,000	2,800	13,000	1.69	1.95	B.
February	20,000	5,000	8,340	1.08	1.12	C.
March	92,200	15,300	41,600	5.40	6.23	A.
April	54,800	14,600	30,000	3.90	4.35	A.
May	26,500	10,200	17,500	2.27	2.62	A.
June	22,200	4,250	14,600	1.90	2.12	A.
July	5,720	1,430	3,260	.423	.49	A.
August	10,600	1,850	4,200	.545	.63	A.
September	5,830	1,210	3,100	.403	.45	A.
October	5,450	1,630	3,350	.435	.50	A.
November	9,470	1,630	4,950	.643	.72	A.
December	4,120	2,000	2,810	.365	.42	C.
The year	92,200	1,210	12,200	1.59	21.60	

PASSUMPSIC RIVER NEAR ST. JOHNSBURY, VT.

Passumpsic River rises in several small ponds and lakes in the mountainous region of the eastern part of northern Vermont. The West Branch of the river is formed near the base of Mount Pisgah and flows in a general southeasterly direction to its junction with East Branch, which was formed about 8 miles to the north by the run-off from several hills and small mountains. The main river then runs in a general southwesterly direction, receiving several small tributary streams along its course and being joined at Lyndonville by an important branch which rises in the towns of Sheffield and Sutton; it then flows southward to join Connecticut River at East Barnet, having received from the east Sheldon Brook and Moose River, and from the west Millers River and West, Sleepers, and Joes branches.

The river is in general quick falling. There are many power plants along the main river and also on the tributaries, which furnish power chiefly for the manufacture of lumber and kindred products, and for electric lighting. The storage is rather small, but the opportunities for improvement are good.

The upper parts of the basin are fairly well forested; in the lower parts much of the land is cultivated. The whole area is hilly and a great portion of it is rocky. The prevailing rocks are granite and limestone. Clay is found throughout the drainage area, and drift sand is also abundant.

The mean annual precipitation on this basin is probably about 40 inches. The river is generally frozen throughout the winter. On account of the topography and geology the run-off in the freshet season is usually large.

The gaging station, which is located about 5 miles above St. Johnsbury and 2 miles above Centervale, Vt., at a footbridge a short distance below the plant operated by Pierce Bros. in the manufacture of leather board, was established May 26, 1909, in cooperation with the State of Vermont.

The nearest dam below the station is the electric-light plant just below Centervale. At high water this dam causes backwater at the gaging station, but as the power output at this plant is small the effect on the conditions at the Pierce mills is constant for any gage height. At usual stages the river below the station is quick falling, rips being found at several places. On account of the winding of the river in its course, and because of the dam below the station, jams of ice sometimes occur at the bends during the winter and spring.

The staff gage, in two sections, is located at the footbridge. It is read twice daily. The datum has remained unchanged since the establishment of the station. Measurements are made from a suspension footbridge, where the conditions for good results are excellent. As the storage at the Pierce mills is rather small and as the amount of water used during the day is rather uniform, it is believed that the gage heights fairly represent the flow, and the results are good. During the winter months the discharge is affected by ice. A good rating curve has been developed which is based on 1909–10 discharge measurements.

Discharge measurements of Passumpsic River near St. Johnsbury, Vt., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 25 [a]	T. W. Norcross	96	452	5.16	1,580
26 [a]	do	98.5	504	5.62	1,790
26 [a]	do	97	485	5.46	1,680
26 [a]	do	96	476	5.36	1,610
26 [a]	do	96.5	477	5.31	1,620
26 [a]	do	96	454	5.16	1,520
26 [a]	do	96	445	5.05	1,480
28	do	94.5	318	3.71	938
Apr. 20	do	90	263	3.05	624
July 13	G. M. Brett	79	107	1.31	76.7

[a] Measurement made 1 foot below surface, coefficient of 0.83 applied.

Daily gage height, in feet, of Passumpsic River near St. Johnsbury, Vt., for 1910.

[J. Cox, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.90	2.90	6.90	6.20	3.40	3.70	1.85	1.54	1.38	1.69	1.74	1.70
2	1.76	3.00	6.40	5.30	2.90	3.20	1.71	1.48	1.40	2.15	1.68	1.61
3	1.62	2.95	5.00	4.60	2.85	2.95	1.51	1.58	1.32	1.95	2.30	1.59
4	2.00	3.00	4.40	4.10	2.75	2.80	1.96	1.82	1.62	1.72	2.30	1.61
5	2.55	3.10	3.90	4.50	3.90	2.55	1.85	2.15	1.56	1.69	2.40	1.65
6	.....	.....	3.70	5.00	3.30	3.10	1.89	1.82	2.10	1.70	2.30	1.58
7	.....	.....	4.90	6.10	2.85	3.20	1.58	1.82	2.30	1.64	2.05	1.65
8	.....	.....	5.20	5.10	2.70	3.00	1.62	1.68	1.82	1.61	1.94	1.56
9	1.90	.....	3.90	4.20	2.60	2.90	1.64	1.54	1.62	1.52	1.85	1.61
10	.....	2.90	3.20	4.20	3.10	2.55	1.54	1.50	1.62	1.56	1.65	1.68
11	.....	.....	3.10	3.70	2.80	2.55	1.78	1.66	1.55	1.54	1.72	1.72
12	.....	.....	3.10	3.30	2.50	2.55	1.56	1.79	1.46	1.51	1.72	1.75
13	2.10	2.95	2.60	3.00	2.35	2.60	1.54	1.58	1.44	1.48	1.72	1.71
14	.....	.....	2.60	2.90	2.30	2.30	1.58	1.50	1.54	1.50	1.78	1.74
15	.....	.....	2.40	2.85	2.30	2.10	1.55	1.78	1.49	1.50	1.70	1.75
16	2.00	.....	2.35	2.90	2.35	2.10	1.51	2.55	1.49	1.51	1.69	1.88
17	.....	3.00	2.20	2.70	2.20	2.10	1.42	1.81	1.36	1.54	1.68	1.81
18	.....	.....	2.15	2.75	2.10	2.60	1.36	1.59	1.30	1.49	1.66	1.80
19	.....	.....	2.20	3.10	3.00	2.70	1.39	1.89	1.42	1.46	1.65	1.80
20	2.35	2.90	2.25	3.00	2.65	2.20	1.40	1.78	1.39	1.50	1.55	1.90
21	.....	.....	2.60	2.95	2.45	2.10	1.40	1.56	1.39	1.44	1.60	1.95
22	6.10	.....	2.40	2.85	2.40	1.89	1.65	1.51	1.36	1.48	1.62	2.00
23	7.40	.....	2.75	3.70	2.30	2.25	1.91	1.44	1.38	1.64	1.61	2.00
24	5.20	3.20	3.30	3.00	2.20	1.98	1.74	1.46	1.36	1.69	1.65	2.00
25	4.00	.....	5.30	2.70	2.70	1.85	1.64	1.48	1.36	1.62	1.69	2.90
26	4.10	.....	5.40	2.85	8.60	1.88	1.46	1.46	1.50	1.95	1.68	2.75
27	3.60	.....	3.90	4.40	4.60	1.71	1.48	1.42	1.42	1.95	1.51	2.60
28	3.40	6.10	3.90	3.30	4.60	2.70	1.72	1.38	3.80	2.30	1.65	2.40
29	3.20	.....	5.20	2.85	3.20	2.30	1.69	1.45	2.25	2.20	1.60	2.35
30	3.00	.....	6.20	3.40	2.80	1.91	1.56	1.36	1.79	1.91	1.65	2.60
31	3.00	.....	6.10	.....	2.95	.....	1.65	1.31	.....	1.81	.....	2.90

NOTE.—Ice existed at this station from Jan. 1 to 21, from about Feb. 4 to 27, and from about Dec. 7 to 31. During these periods gage heights were taken to water surface.

Daily discharge, in second-feet, of Passumpsic River near St. Johnsbury, Vt., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	577	2,320	2,000	780	906	216	134	96	172	186	175
2	.....	616	2,100	1,600	577	697	178	119	100	306	170	152
3	.....	596	1,470	1,290	558	596	126	144	82	245	355	146
4	.....	.....	1,210	1,080	519	538	248	208	154	180	355	152
5	.....	.....	992	1,250	992	444	216	306	139	172	390	162
6	.....	.....	906	1,470	738	656	227	208	290	175	355	144
7	.....	.....	1,430	1,960	558	697	144	208	355	159	275	.....
8	.....	.....	1,560	1,510	500	616	154	170	208	152	242	.....
9	.....	.....	992	1,120	463	577	159	134	154	129	216	.....
10	.....	.....	697	1,120	656	444	134	124	154	139	162	.....
11	.....	.....	656	906	538	444	197	165	136	134	180	.....
12	.....	.....	656	738	426	444	139	199	114	126	180	.....
13	.....	.....	463	616	372	463	134	144	110	119	180	.....
14	.....	.....	463	577	355	355	144	124	134	124	197	.....
15	.....	.....	390	558	355	290	136	197	122	124	175	.....
16	.....	.....	372	577	372	290	126	444	122	126	172	.....
17	.....	.....	322	500	322	290	105	205	91	134	170	.....
18	.....	.....	306	519	290	463	91	146	78	122	165	.....
19	.....	.....	322	656	616	500	98	227	105	114	162	.....
20	.....	.....	338	616	482	322	100	197	98	124	136	.....
21	.....	.....	463	596	408	290	100	139	98	110	149	.....
22	1,960	.....	390	558	390	227	162	126	91	119	154	.....
23	2,540	.....	519	906	355	338	233	110	96	159	152	.....
24	1,560	.....	738	616	322	254	186	114	91	172	162	.....
25	1,290	.....	1,600	500	500	216	159	119	91	154	172	.....
26	1,080	.....	1,650	558	3,080	224	114	114	124	245	170	.....
27	864	.....	992	1,210	1,290	178	119	105	105	245	126	.....
28	780	1,960	992	738	1,040	500	180	96	949	355	162	.....
29	697	.....	1,560	558	697	355	172	112	338	322	149	.....
30	616	.....	2,000	780	538	233	139	91	199	233	162	.....
31	616	.....	1,960	.....	596	.....	162	80	.....	205	.....	.....

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Monthly discharge of Passumpsic River near St. Johnsbury, Vt., for 1910.

[Drainage area, 237 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,540	.....	453	1.91	2.20	C.
February	1,960	.....	275	1.16	1.21	D.
March	2,320	306	994	4.19	4.83	A.
April	2,000	500	923	3.89	4.34	A.
May	3,080	290	635	2.68	3.09	A.
June	906	178	428	1.81	2.02	A.
July	248	91	155	.654	.75	A.
August	444	80	162	.684	.79	A.
September	949	78	167	.705	.79	A.
October	355	110	174	.734	.85	A.
November	390	126	199	.840	.94	A.
December	.....	.....	140	.591	.68	D.
The year	3,080	.....	393	1.66	22.49	

NOTE.—Discharge for the periods during which ice existed determined from climatologic records and the run-off from White River at Sharon, Vt.

Mean discharge Jan. 1 to 21, estimated, 98 second-feet, ranging from about 60 second-feet to 200 second-feet.

Mean discharge Feb. 4 to 27, estimated, 165 second-feet; no great variation in discharge.

Mean discharge Dec. 7 to 31, estimated, 136 second-feet; no great variation in discharge.

WHITE RIVER NEAR SHARON, VT.

White River, one of the largest streams in Vermont and an important tributary of the Connecticut, rises in the mountainous region of north-central Vermont. It is formed of four main branches. The Third Branch rises in the town of Roxbury, Vt., flows in a general southeasterly direction, is joined near Randolph by Ayers Brook and joins the West Branch at Bethel. This latter branch has its origin in the hills and mountains of Hancock and Granville and flows easterly, being joined at Rochester by the South Branch, and near Bethel by the Locust Branch. The third important branch of the main river, called the Second Branch, rises in the township of Brookfield, flows southward, and joins White River at Royalston. The fourth branch, called the First Branch, is adjacent to the Second Branch, rising in the township of Washington, flowing south, and entering White River at South Royalston. Below South Royalston White River follows a general southeasterly direction to its union with Connecticut River at White River Junction.

A large portion of the drainage basin is characterized by steep wooded slopes. The river furnishes power for several plants used for quarrying or for electric lighting. The mean annual precipitation in this drainage at Strafford is about 40 inches. The winters are fairly severe.

The gaging station, which is 1½ miles from the post office at Sharon, is located about 1,500 feet below the dam of the Vermont Copper Co., and about 800 feet above Central Vermont Railway bridge. It was established May 13, 1909, in cooperation with the State of Ver-

mont, to continue the records formerly obtained by the United States Geological Survey at a station on the highway bridge at Sharon.

An inclined staff gage reading to 10 feet is attached to a large rock on the left bank. A chain gage for use in high water is nailed to trees about 80 feet upstream from the staff gage. The table of daily gage heights, following, is referred to these two gages. There is no danger of backwater at the gage and the effect of the power station is not material.

An island divides the channel above the gages. Discharge measurements are made from two suspension footbridges, which connect the island with the banks. A good rating curve covering the medium and low flows has been developed. The gage datum has not been changed.

A gage record has also been obtained beginning January 20, 1910, of the height of water on the crest of the dam of the Vermont Copper Co. This dam is not used at present for power development, although the gates are sometimes operated in order to draw from the available stored water. The record at the dam is of value in constructing a rating curve to determine the discharge over it in case it should become desirable to abandon the meter station because of the starting of the operation of the power plant.

The conditions are good for obtaining reliable data, except that ice affects the flow of the meter station during the winter months.

By means of an approximate curve of relation between the daily gage readings at the dam and the daily discharge at the meter station fair records of discharge have been computed for the winter months from the gage heights at the dam.

Although there are several power plants above the station, it is assumed that the fluctuations in daily stage caused by them are sufficiently equalized at the dam of the Vermont Copper Co., so that the daily gage record at the current meter station is a fairly accurate index of the discharge.

The following discharge measurement was made by G. M. Brett:

August 17, 1910: Width, 79 feet; area, 151 square feet; gage height, 3.90 feet; discharge, 286 second-feet.

Daily gage height, in feet, of White River near Sharon, Vt., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				7.2	4.8	5.6	4.0	3.7	3.7	4.3	4.1	4.1
2				6.4	4.8	5.2	4.0	3.7	3.7	4.3	4.1	4.1
3				6.0	4.8	4.9	4.0	3.7	3.8	4.3	4.3	4.0
4	4.35			5.8	5.6	4.8	4.0	7.1	3.9	4.2	4.6	3.9
5			5.85	4.6	5.2	4.6	4.0	5.0	3.9	4.1	4.7	4.0
6				5.7	5.0	5.6	4.0	4.6	4.7	4.2	4.9	4.0
7	4.2			6.0	4.8	6.5	3.9	4.3	5.2	4.2	4.6	4.0
8			6.1	5.7	4.7	6.2	3.9	4.2	4.5	4.2	4.5	4.0
9				5.4	4.7	5.5	3.9	4.1	4.2	4.1	4.4	4.0
10				5.6	4.9	5.4	3.8	4.0	4.0	4.1	4.4	4.0
11	4.1		5.7	5.1	4.8	5.2	3.8	4.1	3.9	4.1	4.4	4.0
12				5.0	4.7	5.4	3.8	4.3	3.9	4.1	4.4	3.7
13				4.9	4.6	5.3	3.8	4.1	3.9	4.0	4.3	3.6
14	4.1			4.8	4.6	5.1	3.8	3.9	4.2	4.0	4.3	3.8
15			5.1	4.8	4.6	4.9	3.8	3.9	4.0	4.0	4.3	3.9

Daily gage height, in feet, of White River near Sharon, Vt., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	.....	.....	.....	4.7	4.6	4.9	3.9	4.0	3.9	4.0	4.2	4.2
17	.....	.....	.....	4.7	4.4	5.0	3.8	3.9	3.8	4.0	4.2	4.2
18	4.25	.....	4.6	4.7	4.4	4.9	3.9	3.9	3.8	4.0	4.2	4.0
19	.....	.....	.....	4.8	4.7	4.8	3.9	3.9	3.9	4.0	4.1	4.0
20	.....	.....	.....	4.9	4.5	4.7	3.8	3.8	3.8	4.0	4.1	4.0
21	.....	.....	5.7	4.8	4.4	4.5	3.7	3.7	3.8	4.1	4.1	4.0
22	.....	.....	.....	4.7	4.5	4.5	3.7	3.8	3.8	3.9	4.1	4.0
23	.....	.....	6.9	4.8	4.5	4.4	3.7	3.7	3.8	4.0	4.1	4.0
24	.....	.....	.....	4.7	4.4	4.4	3.7	3.7	3.9	4.7	4.1	4.2
25	.....	.....	7.9	4.6	4.5	4.3	3.7	3.6	3.9	4.1	4.1	4.9
26	.....	.....	7.6	4.6	6.4	4.2	3.7	3.8	3.9	4.1	4.1	4.6
27	.....	.....	6.7	5.8	5.6	4.2	3.7	3.7	4.0	4.1	4.0	4.3
28	.....	.....	.....	5.3	5.4	4.4	3.6	3.5	5.7	4.4	4.0	4.2
29	.....	.....	6.8	5.0	4.8	4.3	3.7	3.7	4.8	4.3	4.1	4.5
30	.....	.....	7.1	4.9	4.7	4.1	3.7	3.6	4.4	4.1	4.1	5.3
31	.....	.....	7.5	.....	4.8	.....	3.7	3.6	.....	4.1	.....	.....

NOTE.—Ice existed at this station most of the time from Jan. 1 to about Mar. 25 and from about Dec. 14 to 17. The channel was probably clear of ice for a few days during the latter part of January, for most of the time from Mar. 1 to 25, and possibly during the last few days of December. The gage readings were probably to water surface during the periods when ice was present.

Daily discharge, in second-feet, of White River near Sharon, Vt., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	180	.....	7,620	5,140	1,180	2,260	440	260	260	680	515	515
2	180	.....	6,940	3,360	1,180	1,700	440	260	260	680	515	515
3	200	.....	6,170	2,870	1,180	1,300	440	260	315	680	680	440
4	180	.....	4,000	2,560	2,260	1,180	440	[a]4,940	375	595	965	375
5	180	.....	1,750	2,260	1,700	965	440	1,430	375	515	1,070	440
6	200	.....	2,260	2,410	1,430	2,260	440	965	1,070	595	1,300	440
7	200	.....	4,000	2,870	1,180	3,740	375	680	1,700	595	965	440
8	180	.....	3,040	2,410	1,070	3,200	375	595	865	595	865	440
9	180	.....	2,000	1,970	1,070	2,120	375	515	595	515	770	440
10	160	.....	1,670	2,260	1,300	1,970	315	440	440	515	770	440
11	160	.....	1,440	1,560	1,180	1,700	315	515	375	515	770	440
12	160	.....	1,590	1,430	1,070	1,970	315	680	375	515	770	260
13	160	.....	1,360	1,300	965	1,830	315	515	375	440	680	215
14	160	.....	1,360	1,180	965	1,560	315	375	595	440	680	250
15	160	.....	1,560	1,180	965	1,300	315	375	440	440	680	250
16	180	.....	1,290	1,070	965	1,300	375	440	375	440	595	345
17	180	.....	1,290	1,070	770	1,430	315	375	315	440	595	250
18	200	.....	810	1,070	770	1,300	375	375	315	440	595	440
19	400	.....	1,010	1,180	1,070	1,180	375	375	375	440	515	440
20	620	.....	1,670	1,300	865	1,070	315	315	315	440	515	440
21	560	.....	2,170	1,180	770	865	260	260	315	515	515	440
22	1,720	.....	1,510	1,070	865	865	260	315	315	375	515	440
23	2,540	.....	3,130	1,180	865	770	260	260	315	440	515	440
24	1,510	.....	3,450	1,070	770	770	260	260	375	1,070	515	595
25	1,360	.....	6,170	965	865	680	260	215	375	515	515	1,300
26	1,080	.....	5,980	965	3,560	595	260	315	375	515	515	965
27	940	.....	4,130	2,560	2,260	595	260	260	440	515	440	680
28	810	7,620	3,500	1,830	1,970	770	215	175	2,410	770	440	595
29	680	.....	4,320	1,430	1,180	680	260	260	1,180	680	515	865
30	680	.....	4,940	1,300	1,070	515	260	215	770	515	515	1,830
31	680	.....	5,770	.....	1,180	.....	260	215	.....	515	.....	1,200

[a] Discharge Aug. 4 from the gage record on the dam was 2,350 second-feet.

NOTE.—Daily discharge for Mar. 8, 15, 26, 27, Mar. 29 to Dec. 13, and Dec. 18 to 30 determined from a well-defined discharge rating curve referred to the gage at the current meter station.

Discharge Jan. 1 to 19 estimated and only approximate. Discharge Jan. 20 to 31, Feb. 28 to Mar. 7, Mar. 9 to 14, Mar. 16 to 25, Mar. 28, and Dec. 14 to 17 computed from a discharge curve which was developed from the gage readings on the crest of the dam, and the corresponding daily discharge as determined at the current meter station below the dam. The gage readings at the dam Feb. 1 to 27 were undoubtedly affected by ice lodging and freezing on the crest of the dam, and hence can not be used directly to obtain the daily discharge.

Discharge Dec. 3 to 11 and Dec. 18 to 22 relatively high as the result of draft on the storage back of the dam of the Vermont Copper Co.

The discharge Dec. 25 to 31 may be high because of backwater from ice below the current-meter station.

Monthly discharge of White River near Sharon, Vt., for 1910.

[Drainage area, 686 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,540	160	541	0.789	0.91	C.
February	7,620	.....	700	1.02	1.06	C.
March	7,620	810	3,160	4.61	5.32	A.
April	5,140	965	1,810	2.64	2.94	A.
May	3,560	770	1,240	1.81	2.09	A.
June	3,740	515	1,420	2.07	2.31	A.
July	440	215	330	.481	.55	A.
August	4,940	175	562	.819	.94	B.
September	2,410	260	566	.825	.92	A.
October	1,070	375	530	.773	.89	B.
November	1,300	440	660	.962	1.07	A.
December	1,830	215	554	.808	.93	C.
The year	7,620	160	1,010	1.47	19.93	

NOTE.—Discharge for Jan. 1–19 and Feb. 1–27 estimated from climatologic records and the discharge from near-by drainage areas.

Mean discharge Feb. 1–27 estimated 444 second-feet; practically constant.

The accuracy for August and October was reduced on account of discrepancies, amounting to several per cent between the monthly mean discharge as obtained from the gage-height record at the dam and that obtained from the record at the current-meter station.

ASHUELOT RIVER AT HINSDALE, N. H.

Ashuelot River, a rather important power stream, rises in the town of Washington, Sullivan County, N. H., and flows in a general southwesterly direction about 45 miles to Connecticut River near Hinsdale. Its drainage basin, comprising approximately 442 square miles, includes Mount Monadnock and is to a considerable extent forested. Water is stored for power at several ponds and reservoirs in the basin.

The gaging station, which is located at the lower highway bridge in the town of Hinsdale, about one-fourth mile below the dam used jointly by the Fisk Paper Co. and the Haile & Frost Manufacturing Co., was established February 22, 1907, in cooperation with Charles Bigelow, treasurer of the Haile & Frost Manufacturing Co. Since June 13, 1909, records have been furnished by Frederick S. Leonard, of the Fisk Paper Co.

The station is about 2 miles above the mouth of the river, but as there is considerable fall below no backwater influence is shown except possibly at very high stages of the Connecticut. The use of water at the dam at Hinsdale causes great daily fluctuations in stage during low-water seasons.

The chain gage is attached to the bridge and is read twice daily. Its datum has remained the same during the maintenance of the station. Discharge measurements are made from the bridge. During the winter the discharge is affected by ice.

Conditions for obtaining accurate discharge measurements are good, and a good discharge rating curve has been developed.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Discharge measurements of Ashuelot River at Hinsdale, N. H., in 1910.

Date.		Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
			Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan.	11[a]	T. W. Norcross	110	158	4.15	215
	16	Borrows and Breed		91	2.87	87.9
	16	do		114	3.37	148
	16	do		119	3.71	150
	16	do		144	3.96	170
	20[b]	D. M. Wood	111	161	4.15	238
July	21	H. K. Borrows		124	2.93	130

[a] Measurement made about 100 feet above the bridge under ice cover. Thickness of ice at the gage, 1.2 feet; water surface to top of ice, 0.15 foot.

[b] Measurement made about 100 feet above the bridge under ice cover. Average thickness of ice, 1.2 feet; average water surface to top of ice, 0.2 foot.

MILLERS RIVER AT WENDELL, MASS.

Millers River rises in several small ponds and lakes in the towns of Ashburnham and Winchendon in north-central Massachusetts, flows in a general southwesterly direction to its junction with Otto River near South Royalston, and thence westward to Millers Falls, where it enters Connecticut River. The principal tributary streams from the north are Tilly River, Moss Brook, and Kemp Brook; from the south, Beaver Brook.

The drainage basin is in general long and narrow. On account of the large number of ponds the river is not flashy, offering a striking contrast to Deerfield River, which enters the Connecticut from the west, and drains an area of about the same size.

Millers River is important because of its power sites, many of which are already developed. Below Erving the slope of the river is great.

The average precipitation through the basin ranges from 44 inches in the upper to 39 inches in the lower part.

A considerable portion of the drainage area is well wooded, hardwood growths predominating. Only a small part is farmed. Clay and sand are found in abundance and the predominant rocks are granites.

The gaging station, which is located at the railroad bridge just west of the Wendell railroad station, was established June 4, 1909.

The work is carried on in cooperation with the State of Massachusetts and the Orange Electric Light Co., which completed a dam on June 1, 1910, 600 feet below an old dam which it replaces and immediately above the gaging station. Power was first delivered at this new plant June 8, 1910. The wheels at the old dam have been run at irregular intervals prior to the completion of the new dam to furnish power and to divert water from the construction work. During the low-water period the use of these wheels interfered seriously with the determination of the correct daily flow of the river. By means of a series of frequent readings through the day and night, an attempt was made to determine the two most favorable times of day for reading the gage heights in order to give the true mean height of the river for the day.

During 1910 a new dam was also completed 1½ miles below the gage. This latter dam causes backwater at the gage at medium and high stages, requiring a new discharge rating curve. To what extent this backwater effect is variable is not known.

Discharge measurements are made from the railroad bridge or by wading. The conditions are only fair on account of the rough bed, swift velocity, and the distance from the bridge to the water. Two good discharge rating curves have been developed from 1909–1911 discharge measurements.

During the winter the formation of ice in the still water below the bridge causes backwater at the gage section. The chain gage is attached to the railroad bridge. The datum has been unchanged. The gage heights are observed under the direction of F. B. Saunders, superintendent of the Orange Electric Light Co.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the diurnal fluctuation in the daily gage heights provided the changed conditions since the construction of the two new dams will warrant it, thus making possible the publication of accurate computations of daily discharge at this station. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge. How far it will be possible to reclaim the records of gage heights taken prior to the construction of the two new dams is impossible to say, but every reasonable effort will be made to determine the discharges as accurately as possible for this station for 1909 and 1910 by means of a thorough study of the conditions during those years.

Discharge measurements of Millers River at Wendell, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 14[a]	D. M. Wood	108	211	2.34	400
Mar. 2[a]	do	119	702	6.40	3,360
5[b]	T. W. Norcross	116	437	4.21	2,300
9[b]	D. M. Wood	119	516	4.89	2,840
July 19[c]	H. B. Alvord	23	228	.....	97
19[c]	do	28	238	.....	131
Sept. 14[d]	W. G. Hoyt	54	38	.84	33.5

[a] Ice below the gage.
[b] River clear of ice.
[c] Measurement shows flow through gates only.
[d] Measurement made by wading above bridge shows leakage in wheel pit.

MOSS BROOK AT WENDELL, MASS.

Moss Brook, a small tributary to Millers River, rises in Lake Moore, in the town of Warwick, near the boundary between New Hampshire and Massachusetts, and flows southward into Millers River at Wendell, Mass. Its length from the lake to Millers River is approximately 4 miles, and it flows directly into the pond formed by the dam of the Athol Gas & Electric Co.

A gaging station was originally established June 4, 1909, at a small wooden highway bridge across the brook, about 100 feet above its junction with Millers River.

The vertical staff gage was bolted to the downstream side of the right abutment. Measurements were made from the bridge or by wading. The rough bed and low current velocities made the section at the bridge poor for discharge measurements.

As backwater from the new dam constructed on Millers River below Wendell extended to the bridge station, it was discontinued October 16, 1909. On April 25, 1910, a weir was constructed about one-fourth mile above the mouth of the brook. The weir was of the thin-edge type, made of wood faced with iron and constructed with two crests, the lower being 9.96 feet in length, and the upper (including the lower) 15.92 feet in length. The average elevation of the lower crest is 96.885 feet. The average elevation of the upper crest is 98.38 feet. The elevation of the top of the weir is 99.83 feet.

A staff gage is set in the pond above the weir, with its zero at the same elevation as the lower crest and is read twice daily. The gage heights for 1909 refer to the gage at the bridge, and those for 1910 refer to the gage at the weir.

Three test current-meter measurements indicate that the Francis formula is not strictly applicable to this weir. One of the measurements indicated leakage when the depth of water on the lower crest is more than 0.4 foot.

The discharge rating curve developed for the bridge section and used during 1909 is only approximate. The discharge rating curve

used for 1910 is approximately a mean between the curve developed from Francis's formula and the curve developed by the discharge measurements. The discharge records for 1910 are also approximate.

Assistance in the construction of the weir and in the maintenance of this station was rendered by F. B. Saunders.

Discharge measurements of Moss Brook at Wendell, Mass., in 1909–10.

Date.	Hydrographer.	Gage height.	Discharge.
1909.		*Feet.*	*Sec.-ft.*
June 5	D. M. Wood	1.21	8
22	do	1.18	6
Aug. 3	do	.94	1.5
27	do	.96	2
Oct. 8	Norcross and Wood	.99	6
Dec. 17	D. M. Wood		10.5
1910.			
Apr. 25[a]	do	.55	19.3
July 19[b]	H. B. Alvord	.20	2.8
Sept. 14[b]	W. G. Hoyt	.10	1.77

[a] Measurement made from bridge. [b] Measurement made at wading section.

NOTE.—The gage heights for 1909 refer to the gage at the meter station at the bridge. The gage heights for 1910 refer to the gage at the weir.

Daily gage height, in feet, and discharge, in second-feet, of Moss Brook at Wendell, Mass., for 1909.

[W. P. Leonard, observer.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1			1.02	3.1	0.98	2.4	1.00	2.7	1.05	3.6
2			1.02	3.1	.97	2.2	1.00	2.7	1.05	3.6
3			1.02	3.1	.95	1.8	.99	2.5	1.05	3.6
4	1.22	7.4	1.02	3.1	.95	1.8	.98	2.4	1.05	3.6
5	1.22	7.4	1.04	3.5	1.03	3.3	1.00	2.7	1.03	3.3
6	1.68	25.8	1.02	3.1	1.02	3.1	1.00	2.7	1.03	3.3
7	1.52	17.4	1.02	3.1	1.02	3.1	.99	2.5	1.02	3.1
8	1.40	12.9	1.02	3.1	1.01	2.9	.99	2.5	1.10	4.6
9	1.31	9.9	1.00	2.7	1.00	2.7	.98	2.4	1.08	4.2
10	1.28	9.0	1.00	2.7	.98	2.4	.98	2.4	1.06	3.8
11	1.38	12.2	1.00	2.7	.95	1.8	1.00	2.7	1.03	3.3
12	1.33	10.6	1.00	2.7	.95	1.8	1.00	2.7	1.03	3.3
13	1.28	9.0	1.00	2.7	1.00	2.7	.99	2.5	1.02	3.1
14	1.27	8.8	1.00	2.7	.99	2.5	.99	2.5	1.02	3.1
15	1.25	8.2	1.00	2.7	.98	2.4	.99	2.5	1.00	2.7
16	1.22	7.4	.98	2.4	1.10	4.6	1.05	3.6	1.00	2.7
17	1.20	6.8	1.05	3.6		7.4	1.04	3.5		
18	1.46	15.1	1.03	3.3	1.32	10.3	1.03	3.3		
19	1.46	15.1	1.02	3.1	1.30	9.6	1.00	2.7		
20	1.30	9.6	1.00	2.7	1.10	4.6	.99	2.5		
21	1.28	9.0	1.00	2.7	1.10	4.6	.99	2.5		
22	1.22	7.4	.98	2.4	1.04	3.5	.98	2.4		
23	1.15	5.7	.98	2.4	1.02	3.1	.98	2.4		
24	1.15	5.7	1.02	3.1	1.01	2.9	1.00	2.7		
25	1.05	3.6	1.00	2.7	1.01	2.9	1.10	4.6		
26	1.02	3.1	1.00	2.7	1.00	2.7	1.25	8.2		
27	1.02	3.1	1.00	2.7	.99	2.5	1.37	11.9		
28	1.10	4.6	1.00	2.7	.98	2.4	1.65	24.0		
29	1.08	4.2	1.00	2.7	.98	2.4	1.50	16.5		
30	1.04	3.5	.98	2.4	.98	2.4	1.25	8.2		
31			.98	2.4	.97	2.2				

NOTE.—Daily discharge determined from a poorly defined discharge rating curve. Discharge Aug. 17, 1909, interpolated.

Daily gage height, in feet, and discharge, in second-feet, of Moss Brook at Wendell, Mass., for 1910.

[F. B. Saunders, observer.]

Day.	April.		May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1			0.715	26	0.36	7.7			0.08	1.0
2			.66	23	.32	6.4			.08	1.0
3			.62	20	.30	5.7			.20	3.2
4			.75	28	.235	4.1			.155	2.3
5			.765	29		5.5			.285	5.3
6			.70	25	.335	6.9			.175	2.7
7			.60	19.0	.43	10.4				2.2
8			.64	21	.355	7.6			.12	1.7
9			.565	17.1	.30	5.7			.95	1.2
10			.60	19.0	.32	6.4			.09	1.2
11			.565	17.1	.85	34			.20	3.2
12			.525	14.9		27			.16	2.4
13			.50	13.5	.615	19.9			.10	1.3
14			.47	12.2	.475	12.4				1.4
15			.45	11.3	.37	8.1				1.5
16			.425	10.2	.32	6.4				1.6
17			.41	9.5	.52	14.6				1.7
18			.47	12.2	.48	12.6				1.8
19			.61	19.6		9.5	0.10	1.3		1.9
20			.50	13.5	.32	6.4	.15	2.2		2.0
21			.47	12.2	.25	4.4	.15	2.2	.15	2.2
22			.47	12.2	.20	3.2	.15	2.2	.15	2.2
23			.43	10.4	.17	2.6	.10	1.3	.145	2.2
24			.405	9.3	.12	1.7		1.2	.140	2.1
25	0.55	16.2	.35	7.4	.10	1.3	.08	1.0	.140	2.1
26	1.00	43	.34	7.1	.07	.9	.85	1.1	.132	1.9
27	1.40	70	.32	6.4	.06	.8	.07	.9	.130	1.9
28	1.04	45	.30	5.7	.08	1.0	.08	1.0		
29	.835	33	.26	4.7	.05	.6	.08	1.0		
30	.77	29	.22	3.7	.02	.3	.085	1.1		
31			.32	6.4				1.0		

NOTE.—The gage heights during the latter part of June are not good, owing to leakage through a hole underneath the weir.

Daily discharge determined from a discharge rating curve well defined below discharge of 20 second-feet. The values, however, are somewhat vitiated by variable leakage underneath the weir, particularly during the latter part of June.

The discharge for days when the gage was not read was interpolated.

Monthly discharge of Moss Brook at Wendell, Mass., for 1909–10.

[Drainage area, 12.5 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1909.						
June 4–30	25.8	3.1	8.98	0.718	0.71	D.
July	3.6	2.4	2.84	.227	.26	D.
August	10.3	1.8	3.39	.271	.31	D.
September	24.0	2.4	4.58	.366	.41	D.
October 1–16	4.6	2.7	3.43	.274	.16	D.
1910.						
April 25–30	70	16.2	39.4	3.18	.71	D.
May	29	3.7	14.4	1.16	1.34	D.
June	34	.3	7.80	.629	.70	D.
July 19–31	2.2	.9	1.35	.109	.05	D.
August 1–27	5.3	1.0	2.04	.165	.17	D.

DEERFIELD RIVER.

GENERAL FEATURES OF AREA DRAINED.

Deerfield River, the second largest tributary of Connecticut River, rises in the towns of Stratton and Somerset, Vt., follows a generally southerly course for about 45 miles, receiving several tributary streams, the most important of which are the East Branch, at Searsburg, Vt.; the North Branch, at Wilmington, Vt.; and the West Branch, at Readsboro, Vt. The river enters Massachusetts at Monroe Bridge and then flows southward to Hoosac Tunnel, where it turns to the southeast, and unites with Connecticut River near Greenfield, Mass.

The greater portion of the basin is wooded and but little land is under cultivation. In the lower part, however, there is considerable cultivated land. The slopes are for the most part steep, and upper portions of the basin attain elevations of over 3,800 feet above sea level. The average elevation of the basin at Shelburne Falls, Mass., is about 1,800 feet; at Hoosac Tunnel, Mass., 2,300 feet; and at Searsburg, Vt., 2,500 feet.

The mean annual precipitation for the upper part of the basin is probably about 48 inches; in the lower part it is probably several inches less. Winters are fairly severe. The average depth of snowfall for January and February at Jacksonville, Vt., is about 25 inches, and the mean temperature for these months is about 18°.

Several power sites have already been developed, but there are many undeveloped sites. The river throughout its course is quick falling and rapid.

On account of the steep slopes and the rocky formation of this basin the river is extremely flashy. The present storage is very small.

DEERFIELD RIVER AT HOOSAC TUNNEL, MASS.

This station, which is located at the highway bridge near the Hoosac Tunnel railroad station, was established July 17, 1909. With the other stations in this State it is being carried on in cooperation with the State of Massachusetts.

The bed of the river is rough, the current is very swift, and there is no danger of any artificial backwater. During the winter the relation of gage height to discharge is affected by the presence of ice.

Discharge measurements are made from the highway bridge to which the chain gage is attached. The datum of the gage has not been changed. A fairly good discharge curve has been developed from 1909 and 1910 measurements.

Owing to controlled flow at this station the gage height fluctuates greatly during each 24-hour period. Tests have been made to deter-

mine the relation between the average of the two daily readings of the gage and the true mean gage height for the day. These tests indicate no very definite law, but show that, although for any one day the discharge as determined from two readings may vary greatly from the true mean discharge for that day, the errors for a period of a month are almost entirely compensating. The gage heights for 1910 are withheld pending further investigation and improvement of computations of discharge from records obtained from an automatic gage.

Discharge measurements of Deerfield River at Hoosac Tunnel, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 16[a]	D. M. Wood	158	229	2.36	328
Mar. 1[b]	do	205	1,130	6.92	6,410
4[b]	T. W. Norcross	176	554	4.02	1,720
8[b]	D. M. Wood	177	548	4.01	1,590
25[b]	do	193	797	5.37	3,390
Apr. 26[b]	do	194	767	5.15	3,130
Sept. 16[c]	W. G. Hoyt	95	182	1.40	85.5
Oct. 25	C. C. Covert			1.45	107
Dec. 19[d]	W. G. Hoyt	105	95.4	1.26	34

[a] Measurement made under partial ice cover.
[b] Observations 1.0 foot depth; coefficient 0.80.
[c] Wading below bridge.
[d] Complete ice cover; gage height to top of ice 1.78; average thickness of ice 0.86 foot.

DEERFIELD RIVER AT SHELBURNE FALLS, MASS.

This station, which is located at the plant of the Greenfield Electric Light & Power Co., was established October 7, 1909.

Records have been kept at the power plant since the early part of 1907, but the early data were too incomplete for computation of daily discharge. Since the fall of 1908, when the dam was raised about 3 feet, the records have improved materially and the results are considered excellent.

The dam is of concrete, of ogee section, and is similar in form to one that has been rated. The flow through the wheels is computed from the gate openings and power readings made at half-hour intervals. The total electrical output is also measured twice a day. Readings are made three times daily of the height of water on the dam, in the forebay, in the tailrace, and at the wasteways.

Two units are now installed. Ratings have been made of one of these units by the Survey for use in conjunction with the Holyoke ratings of the wheels.

Owing to the extreme care with which the readings are made, winter and summer, the records at this station should prove valuable.

Daily discharge, in second-feet, of Deerfield River at Shelburne Falls, Mass., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	151	636	11,209	4,880	1,070	1,590	222	136	56	146	185	193
2	232	500	6,359	4,120	989	1,180	189	104	71	112	167	155
3	200	577	4,250	2,970	954	925	186	135	14	244	498	122
4	223	499	2,989	2,630	1,070	710	172	135	90	90	957	156
5	236	496	2,353	2,510	1,010	660	171	141	229	128	908	100
6	297	288	2,585	2,870	887	3,570	190	136	710	111	876	117
7	1,098	204	4,952	2,940	756	2,240	169	104	707	92	462	140
8	321	318	3,298	2,070	684	1,540	193	114	304	111	326	144
9	638	532	2,287	1,430	625	1,170	125	96	243	68	280	119
10	565	490	1,628	1,140	744	1,170	113	101	184	115	273	77
11	403	583	1,426	1,010	724	2,520	94	196	16	89	310	56
12	404	343	1,296	1,030	657	2,590	152	260	120	144	280	96
13	317	409	1,411	919	552	2,210	131	192	103	109	273	97
14	278	212	1,582	821	526	1,440	102	113	174	118	298	123
15	295	385	1,184	790	724	1,160	105	140	155	100	262	121
16	284	418	1,064	782	618	961	131	104	111	62	226	110
17	254	725	1,066	749	512	1,170	81	136	92	102	209	139
18	1,142	706	879	850	604	1,290	100	106	56	86	172	33
19	902	620	869	1,930	942	1,090	278	62	84	135	200	140
20	1,048	617	1,660	1,320	1,010	818	235	75	78	101	133	112
21	1,555	825	3,075	1,050	799	666	262	82	143	73	149	134
22	16,881	2,048	2,655	858	942	491	121	108	110	93	225	115
23	5,925	1,067	3,112	944	709	447	141	53	73	131	169	105
24	3,326	970	3,560	710	618	508	88	97	115	190	157	242
25	2,457	906	9,465	653	786	247	121	120	85	219	251	594
26	1,680	815	8,225	4,750	1,710	248	145	82	149	171	183	273
27	1,405	1,148	4,585	4,170	1,390	281	188	50	117	158	221	278
28	1,056	9,831	4,076	2,020	865	278	397	39	144	171	125	304
29	1,041	.....	6,160	1,360	655	277	157	55	160	252	209	286
30	857	.....	7,485	1,220	565	275	152	63	193	180	235	294
31	925	.....	5,837	.....	1,700	.....	145	65	.....	189	.....	277

Monthly discharge of Deerfield River at Shelburne Falls, Mass., for 1910.

[Drainage area, 501 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	16,881	151	1,500	2.99	3.45
February	9,831	204	970	1.94	2.02
March	11,209	869	3,630	7.25	8.35
April	4,880	653	1,850	3.69	4.12
May	1,710	512	851	1.70	1.96
June	3,570	247	1,124	2.24	2.50
July	397	81	163	.33	.38
August	260	39	110	.22	.25
September	710	14	163	.33	.37
October	252	62	132	.26	.30
November	957	125	307	.61	.68
December	594	33	169	.34	.39
The year	16,881	14	914	1.82	24.77

CHICOPEE RIVER.

GENERAL FEATURES OF AREA DRAINED.

Chicopee River, the largest tributary of the Connecticut in respect to drainage area, is formed at Three Rivers, Mass., by the union near that point of Quaboag, Ware, and Swift rivers.

Ware River, formed in the town of Barre, Worcester County, by the union of several small streams, drains an area comprising about 162 square miles. This area is hilly and is for the most part square. The flow of the stream is well sustained in dry seasons.

Swift River has three main branches; the Middle Branch, which rises in North Pond near the town of Orange and flows southward, is joined a mile or two above Enfield by the East Branch and about 2 miles below that village by the West Branch. The distance by river from the North Pond to Three Rivers is 30 miles.

Quaboag River, the most southerly of the three streams, is formed near East Brookfield by the union of a number of small streams that drain a series of ponds, and takes a general southwesterly course to Three Rivers.

From Three Rivers the Chicopee flows westward 15 miles and joins the Connecticut approximately between Springfield and Holyoke. The country drained is hilly and the slope of the river is considerable, averaging 15 feet or more per mile. The bed of the Chicopee is composed chiefly of gravel with edges of red sandstone crossing at intervals, as at Chicopee Falls, Ludlow, and other points. The banks are of good height, rising in some places to low hills, on others being succeeded by level or gently rolling well-cultivated meadow land. The surrounding country is comparatively level along the river but becomes hilly toward Three Rivers. Many lakes and ponds drain to the river through its numerous tributaries and the dry season flow is well sustained. The Quaboag is one of the best-controlled streams in Massachusetts, as the natural pond area is large, and these ponds, together with artificial ponds formed at the numerous power plants, materially retard floods and equalize the flow throughout the year.

WARE RIVER NEAR WARE, MASS.

This station, which is located at the steel highway bridge about 2 miles above the village of Ware, was established September 15, 1904, in cooperation with the Otis Co. and the George H. Gilbert Manufacturing Co., of Ware.

The nearest dam downstream is that of the Otis Co., at Ware, about 2½ miles below the gage. Upstream the nearest dam is at Gilbertville, a little over a mile.

A chain gage is attached to the bridge from which discharge measurements are made. The gage datum has remained the same during the maintenance of the station.

During the winter months the discharge is usually affected by ice. The river does not usually freeze at the gage section, but backwater is caused by anchor ice and ice jams lodging on the river bottom below the gage. Conditions for making discharge measurements are good, but the measurements do not plot well on the rating curve, because of change in conditions of the channel, due to the growth of grass and weeds during the summer and backwater effect from the dam at Ware below. The daily gage heights do not represent the true 24-hour means, fluctuating with the operations of power plants above. When sufficient funds are available, it is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Discharge measurements of Ware River near Ware, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 2[a]	T. W. Norcross	83.3	4.44	6.80	2,240
2[a]	do	83.3	4.44	6.76	2,230

[a] Measurements made by subsurface velocity method; coefficient of 0.85 used.

SWIFT RIVER AT WEST WARE, MASS.

This station, which was established July 15, 1910, is located at the footbridge about 400 feet below a wooden dam, near the West Ware station of the Athol branch of the Boston & Albany Railroad, about 6 miles by river downstream from Enfield.

A standard chain gage is attached to the downstream side of the bridge, and a staff gage is fastened to the crest of the dam.

Measurements are made from the bridge or by wading below the dam. By means of the measurements and comparison of the gage heights it is expected that the dam can be rated. A power house used in conjunction with the dam at which records were for a short time obtained has burned down.

Sufficient data have not been obtained to develop a discharge rating curve.

Conditions are fairly good for making current-meter measurements. The gage heights are affected by the operation of power plants above the station.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights at this station are true indexes of the daily discharge.

Discharge measurements of Swift River at West Ware, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 15	T. W. Norcross	51	56.3	2.82	102
15	H. B. Alvord	49	51.0	2.70	70.4
Sept. 9[a]	W. G. Hoyt	51	60.6	3.17	145

[a] Wading above bridge.

QUABOAG RIVER AT WEST BRIMFIELD, MASS.

This station, which is located at a highway bridge near the West Brimfield station of the Boston & Albany Railroad, was established August 23, 1909, in cooperation with the State of Massachusetts.

Discharge measurements are made from the bridge to which the staff gage is attached, or by wading. Conditions for making discharge measurements are good except during the winter months, when ice interferes with the flow.

During periods of low water gage heights show marked fluctuations during the day owing to the operation of the mills at and above West Warren. The gage is read twice daily, with and without the mills running, but it is not known what error remains in the resulting daily gage heights. The datum has remained unchanged.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Discharge measurements of Quaboag River at West Brimfield, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 17[a]	D. M. Wood	55	104	2.81	316
17[a]	do	55	114	3.02	353
Mar. 2	T. W. Norcross	54	214	4.71	1,480
2	do	54	214	4.68	1,470
6	do	54	189	4.17	1,110
6	do	54	189	4.17	1,100
10	D. M. Wood	55	177	4.00	908
23[b]	do	54	98	2.85	222
23[c]	do	54	121	3.18	406
23	do	54	117	3.11	389
July 11	R. C. Rice	54	79	2.30	125
16[d]	H. B. Alvord	43	33	1.70	16
16	do	52	118	2.35	136
Sept. 11[e]	W. G. Hoyt	52	45.1	1.97	64.6

[a] Some ice in river.
[b] Gage height variable.
[c] Water fell 0.11.
[d] Partially estimated.
[e] Wading below bridge.

WESTFIELD RIVER.

GENERAL FEATURES OF AREA DRAINED.

The main branch of Westfield River rises in the Berkshire Hills, in the northeastern part of Berkshire County, Mass., and flows in a southeasterly direction to its junction with Swift River. Its course is then generally southward to Huntington, the tributary streams from the west being the Middle Branch and West Branch of Westfield River, and from the east the East Branch.

The Middle Branch of Westfield River rises in the hills near East Windsor, flows southeast, and enters Westfield River above Huntington, its total length being about 24 miles.

The West Branch of Westfield River rises near Washington, flows nearly parallel to the Middle Branch, and enters the Westfield at Huntington, about 2 miles below the Middle Branch. Its total length is about 22 miles.

From Huntington the Westfield flows in a general southeasterly direction, receiving from the west Freeland Brook and Westfield Little River. Where it flows through the town of Agawam it is known as Agawam River. It enters Connecticut River about half a mile below Springfield. Its total length is made up of a series of rapids and quick water. The amount of storage in the basin is insignificant. Several important power plants are installed at Agawam West Springfield, Westfield, and Woronoco, and there are smaller ones farther up the river. The opportunities for further development are numerous. The average rainfall in this area is more than 40 inches.

WESTFIELD RIVER AT KNIGHTVILLE, MASS.

This station, which is located at the steel highway bridge (locally known as the Pitcher Bridge) at Knightville, about 4½ miles north of the town of Huntington, 1 mile north of the outlet of Norwich Lake, and about 3 miles north of the junction with the Middle Branch of Westfield River, was established August 26, 1909, in cooperation with the State of Massachusetts.

The Westfield at this point is quick falling. The bed is rough, being formed of large gravel and ledge rock. There is no danger of artificial backwater, as the fall between this station and the nearest dam below, at Huntington, is great.

A chain gage is attached to the highway bridge.

Discharge measurements are made from the highway bridge, where the conditions are fairly good.

During the winter anchor ice and ice cover interfere materially with the flow.

The rating curve has been fairly well defined from 1909–1911 discharge measurements. During the year no change was made in the gage datum.

It is stated, and a study of the daily gage-height records tends to indicate, that there is no mill control on this stream above the Knightville station, hence for open-water periods the discharge data are considered reliable.

Discharge measurements of Westfield River at Knightville, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 3	T. W. Norcross	114	423	4.03	1,320
24	D. M. Wood	112	393	3.90	1,120
July 12	R. C. Rice	104	132	1.19	53.3
Sept. 7	W. G. Hoyt	105	321	2.89	614
Oct. 14[a]	F. J. Shuttleworth	53	35.9	.99	28.7

[a] Wading above bridge.

Daily gage height, in feet, of Westfield River at Knightville, Mass., for 1910.

[G. A. Fisk, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.10	2.16	4.90	3.67	2.28	2.62	1.56	1.18	0.70	1.03	0.89	1.53
2	2.10	2.10	4.25	3.48	2.12	2.45	1.46	1.10	.92	1.04	.98	1.39
3	2.18	2.12	4.00	3.41	1.98	2.22	1.38	1.05	.90	.93	2.32	1.58
4	2.09	2.16	4.10	3.10	1.92	2.08	1.32	1.14	1.43	.92	3.26	1.63
5	2.18	2.02	4.95	2.70	1.98	1.98	1.30	1.31	2.36	.91	3.10	1.62
6	2.39	1.89	4.70	2.55	1.88	3.36	1.31	1.26	2.38	.89	2.48	1.61
7	3.02	1.80	4.40	2.51	1.75	2.82	1.32	1.11	3.02	.94	1.30	1.51
8	3.05	1.78	4.80	2.50	2.08	2.53	1.18	1.10	2.45	1.04	1.14	1.54
9	3.04	1.97	3.84	2.42	2.62	2.41	1.10	1.07	1.68	1.04	1.36	1.52
10	2.98	2.09	4.15	2.38	2.38	2.65	1.10	1.15	1.42	.99	1.50	1.41

Detailed gage height, in feet, of Westfield River at Knightville, Mass., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	3.13	2.03	3.86	2.25	2.15	4.02	1.12	1.40	1.32	.96	1.27	1.31
12	3.32	2.00	3.60	2.20	2.24	3.25	1.18	1.25	1.15	.93	1.50	.....
13	3.32	1.93	3.40	2.19	2.14	2.53	1.14	1.20	1.06	.95	1.46	.....
14	3.02	2.00	3.10	2.10	2.22	2.38	1.11	1.18	1.12	1.00	1.40	.....
15	3.09	2.00	3.01	2.12	2.92	2.20	1.10	1.14	1.08	.98	1.38	.....
16	2.93	2.16	2.95	2.12	2.32	2.23	1.10	1.11	1.10	.98	1.32	.....
17	3.09	2.27	2.78	2.10	2.05	2.58	1.07	1.00	1.08	.93	1.42	1.55
18	3.13	2.31	2.45	2.38	1.98	2.68	1.05	1.02	.96	.94	1.36	.....
19	3.34	2.34	2.40	2.98	1.90	2.44	1.05	1.24	.94	.88	1.36	.....
20	3.56	2.24	2.44	2.45	1.95	2.24	1.06	1.18	.91	.83	1.42	.....
21	3.66	2.48	3.76	2.30	1.88	2.11	1.06	1.10	.88	.84	1.56	.....
22	8.90	2.61	3.58	2.20	2.02	1.92	1.04	.94	.90	1.02	1.41	.....
23	6.20	2.54	3.46	2.15	1.92	1.78	1.14	.94	.85	1.06	1.46	1.35
24	5.36	2.58	3.64	2.10	1.88	1.70	1.10	.92	.84	1.01	1.52	.....
25	4.28	2.46	4.65	2.12	1.92	1.68	1.06	.96	1.08	.99	1.53	2.60
26	3.76	2.36	4.92	5.40	2.02	1.60	1.04	.98	1.16	.94	1.46	2.85
27	3.76	3.01	4.01	4.46	1.94	1.61	1.05	.80	1.10	.92	1.41	2.75
28	3.30	5.15	4.22	4.10	1.97	1.60	1.00	.85	1.08	.89	1.44	2.99
29	3.01	.....	4.01	3.20	1.88	1.60	1.02	.82	1.12	.90	1.58	3.18
30	2.64	.....	3.90	2.62	2.02	1.58	1.11	.82	1.12	.88	1.63	3.21
31	2.34	.....	3.72	.....	2.62	.....	1.21	.80	.....	.86	.....	3.16

NOTE.—Ice existed at this station from Jan. 1 to 21, from about Feb. 9 to 27, and from about Dec. 3 to 31. Gage readings during these periods probably to water surface.

Daily discharge, in second-feet, of Westfield River at Knightville, Mass., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	295	1,820	1,040	342	484	113	46	12	31	20	107
2	.....	273	1,390	929	280	410	92	37	22	32	27	78
3	.....	280	1,240	890	231	318	77	32	21	23	358	.....
4	.....	295	1,300	720	212	266	66	41	86	22	808	.....
5	.....	245	1,850	520	231	231	63	65	374	22	720	.....
6	.....	202	1,680	452	199	863	65	57	382	20	422	.....
7	.....	175	1,480	434	161	580	66	38	680	24	63	.....
8	.....	169	1,740	430	266	444	46	37	410	32	41	.....
9	.....	.....	1,140	398	484	394	37	34	142	32	73	.....
10	.....	.....	1,320	382	382	498	37	42	84	27	100	.....
11	.....	.....	1,150	330	292	1,250	39	80	66	25	58	.....
12	.....	.....	995	310	326	802	46	56	42	23	100	.....
13	.....	.....	885	306	252	444	41	48	33	24	92	.....
14	.....	.....	720	273	318	382	38	46	39	28	80	.....
15	.....	.....	675	280	630	310	37	41	35	27	77	.....
16	.....	.....	645	280	358	322	37	38	37	27	66	.....
17	.....	.....	560	273	256	466	34	28	35	23	84	.....
18	.....	.....	410	382	231	511	32	30	25	24	73	.....
19	.....	.....	390	660	205	406	32	54	24	20	73	.....
20	.....	.....	406	410	222	326	33	46	22	18	84	.....
21	.....	.....	550	350	199	277	33	37	20	18	113	.....
22	5,120	.....	984	310	245	212	32	24	21	30	82	.....
23	2,780	.....	918	292	212	169	41	24	18	33	92	.....
24	2,140	.....	1,020	273	199	147	37	22	18	29	104	.....
25	1,410	.....	1,650	280	212	142	33	25	35	27	107	.....
26	1,090	.....	1,830	2,160	245	122	32	27	44	24	92	.....
27	1,090	.....	1,240	1,520	218	124	32	16	37	22	82	.....
28	830	1,990	1,370	1,300	228	122	28	18	35	20	88	.....
29	675	.....	1,240	775	199	122	30	17	39	21	118	.....
30	493	.....	1,180	484	245	118	38	17	39	20	130	.....
31	366	.....	1,070	.....	484	.....	50	16	.....	19	.....	.....

NOTE.—Daily discharge determined from a fairly well defined discharge rating curve.

Monthly discharge of Westfield River at Knightville, Mass., for 1910.

[Drainage area, 162 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	5,120	.....	557	3.44	3.97	C.
February	1,990	.....	245	1.51	1.57	D.
March	1,850	390	1,120	6.91	7.97	A.
April	2,160	273	581	3.59	4.00	A.
May	630	161	276	1.70	1.96	B.
June	1,250	118	375	2.31	2.58	B.
July	113	28	45.7	.282	.33	B.
August	80	16	36.7	.227	.26	C.
September	680	12	95.9	.592	.66	B.
October	33	18	24.7	.152	.18	C.
November	808	20	148	.914	1.02	B.
December	.....	.....	86.2	.532	.61	D.
The year	5,120	12	300	1.85	25.11	

NOTE.—Discharge for periods during which ice was present computed from climatologic records and the discharge from near-by drainage areas.
Mean discharge, Jan. 1 to 21, estimated 60 second-feet; practically constant.
Mean discharge, Feb. 9 to 27, estimated 154 second-feet; practically constant.
Discharge, Dec. 3 to 31, varied from about 30 second-feet to about 400 second-feet.

MIDDLE BRANCH OF WESTFIELD RIVER AT GOSS HEIGHTS, MASS.

This station, which is located at a single-span highway bridge in the hamlet of Goss Heights, about 1½ miles north of the village of Huntington and half a mile above the confluence of the North and Middle branches of Westfield River, was established July 14, 1910, by the United States Geological Survey in cooperation with the State of Massachusetts.

A standard chain gage is attached to the upstream side of the bridge and read twice daily. There is a power plant 2 miles above, but the gage-height record indicates that it probably has little effect upon the flow, so that it is assumed that the average of the two daily readings gives the correct mean gage height for the day.

Conditions are fair for making accurate discharge measurements, except in times of unusually low water.

Discharge measurements of Middle Branch of Westfield River at Goss Heights, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 14 [a]	T. W. Norcross	10.9	7.9	1.03	8.6
23 [a]	H. B. Alvord	10.0	11.4	1.00	3.7
Sept. 7 [b]	W. G. Hoyt	88	77.8	1.54	114
8 [b]	.....do	88	58.1	1.32	57.7
Oct. 14 [c]	F. J. Shuttleworth	19	17.1	1.02	5.1
14 [c]	.....do	16	9.4	1.02	4.4

[a] Wading below bridge. [b] Wading at bridge (regular section). [c] Wading above bridge.

Daily gage height, in feet, and discharge, in second-feet, of Middle Branch of Westfield River at Goss Heights, Mass., for 1910.

Day.	July.		August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	1.05	8	1.06	10	1.04	7	1.04	7	1.18	27
2	.....	.....	1.08	12	1.06	10	1.01	4	1.06	10	1.21	32
3	.....	.....	1.05	8	.85	2	.95	2	1.35	64	1.24	.....
4	.....	.....	1.05	8	1.45	90	.92	2	1.70	155	1.44	.....
5	.....	.....	1.20	30	1.62	134	.95	2	2.15	282	1.35	.....
6	.....	.....	1.14	20	1.55	116	1.01	4	1.90	210	1.36	.....
7	.....	.....	1.09	13	1.86	199	1.08	12	1.45	90	1.31	.....
8	.....	.....	1.06	10	1.65	142	1.04	7	1.35	64	1.38	.....
9	.....	.....	1.06	10	1.35	64	1.05	8	1.32	57	1.35	.....
10	.....	.....	1.05	8	1.25	41	1.06	10	1.22	34	.....	.....
11	.....	.....	1.20	30	1.11	16	1.04	7	1.41	80	.....	.....
12	.....	.....	1.20	30	1.09	13	1.01	4	1.32	57	.....	.....
13	.....	.....	1.10	14	1.05	8	1.04	7	1.31	54	.....	.....
14	1.02	5	1.09	13	1.04	7	1.01	4	1.25	41	.....	.....
15	1.04	7	1.12	17	1.04	7	1.04	7	1.25	41	.....	.....
16	1.06	10	1.08	12	1.04	7	1.02	5	1.19	28	.....	.....
17	1.04	7	1.05	8	1.01	4	1.04	7	1.21	32	.....	.....
18	1.05	8	1.05	8	1.02	5	1.00	3	1.20	30	.....	.....
19	1.02	5	1.22	34	1.01	4	.88	2	1.26	43	.....	.....
20	1.05	8	1.24	39	1.01	4	.80	1	1.39	75	.....	.....
21	1.06	10	1.05	8	.96	3	.90	2	1.45	90	.....	.....
22	1.08	12	1.02	5	.80	1	1.09	13	1.29	50	.....	.....
23	1.05	8	1.02	5	.95	2	1.12	17	1.25	41	.....	.....
24	1.04	7	1.06	10	.95	2	1.10	14	1.28	48	.....	.....
25	1.05	8	1.04	7	.96	3	1.11	16	1.22	34	.....	.....
26	1.02	5	1.01	4	1.05	8	1.08	12	1.28	48	.....	.....
27	1.04	7	1.05	8	1.04	7	1.04	7	1.24	39	.....	.....
28	1.06	10	1.06	10	1.11	16	1.02	5	1.28	48	.....	.....
29	1.10	14	1.05	8	1.06	10	1.09	13	1.34	62	.....	.....
30	1.08	12	1.05	8	1.01	4	1.10	14	1.25	41	.....	.....
31	1.06	10	1.05	8	.....	.....	1.11	16	.....	.....	.....	.....

NOTE.—Ice existed at this station from about Dec. 3 to 31. The gage heights were probably slightly affected by controlled flow at mills above the station.
Daily discharge determined from a fairly well defined discharge rating curve.

Monthly discharge of Middle Branch of Westfield River at Goss Heights, Mass., for 1910.

[Drainage area, 53 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
July 14-31	14	5	8.50	0.160	0.11	C.
August	39	4	13.3	.251	.29	C.
September	199	1	31.3	.591	.66	B.
October	17	1	7.55	.142	.16	C.
November	282	7	65.2	1.23	1.37	A.
December	.....	.....	30.	.566	.65	D.

NOTE.—Discharge from Dec. 3 to 31 deduced from discharge from near-by drainage areas. During December the maximum attained was probably 100 second-feet and the minimum approximately 5 to 10 second-feet.

WESTFIELD LITTLE RIVER NEAR BLANDFORD, MASS.

Westfield Little River is formed by the union of Peebles and Borden brooks in the southern part of the town of Blandford. The headwaters of Peebles Brook are in North Blandford, at an elevation of

about 1,400 feet above sea level; at its junction with Borden Brook it has an elevation of about 850 feet—a fall of 550 feet in a distance of about 8 miles. Below Borden Brook the river also falls rapidly, reaching an elevation of 200 feet above sea level in the vicinity of West Parish, a distance of 6 miles from Borden Brook. The drainage area at the junction of Peebles and Borden brooks is about 43 square miles; at the mouth of the river, 83.6 square miles. The slopes are very steep and in places precipitous. The greater part of the basin above West Parish is in forest.

The city of Springfield, Mass., has begun to use this river as a source of water supply. A large storage reservoir has been built in the upper part of Borden Brook and a concrete diversion dam near the corners of Russell, Westfield, and Granville. The water is then carried by a tunnel through the mountain, a distance of about a mile, to the filter plant at Mundale. There it is taken through a steel pipe line to Springfield. A distributing reservoir about 5 miles from Springfield is provided at Provin Mountain, Westfield.

The gaging station, which is located a short distance below Borden Brook, at Cobble Mountain, near Blandford, Mass., was established July 13, 1905, and has been maintained since that time in cooperation with the water board of the city of Springfield through its engineer, E. E. Lochridge.

Staff gages and a chain gage have been used to obtain gage heights. All gages have been referred to the same datum, which has remained the same during the maintenance of the station. Discharge measurements are made from a car and cable, or by wading. During the winter months the discharge is affected by ice. Conditions for obtaining accurate discharge data are good, and an excellent discharge rating curve has been developed.

On August 10, 1906, a sharp-crested weir, with crest about 30 feet long, capable of carrying a depth of flow of 1½ feet, was constructed a short distance downstream from the current-meter station. This was maintained with some interruptions until September, 1907, when it was destroyed by high water. Estimates of flow over the weir as given are based on the coefficients given on page 36 of Water-Supply Paper 200. The weir gage was read at approximately the same time as the current-meter gage, and considerable comparative information upon the accuracy at this station has been obtained.[1]

The discharge records are furnished each year by E. E. Lochridge, but are not yet available for publication for 1910.

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[1] See Water-Supply Papers U. S. Geol. Survey Nos. 201, pp. 105–110, and 241, pp. 164–168.

HOUSATONIC RIVER.

GENERAL FEATURES OF AREA DRAINED.

Housatonic River rises in Berkshire County, Mass., and flows southward, entering Long Island Sound near the west end of Connecticut. It is about 125 miles long, and drains a total area of about 1,930 square miles. Its most important tributaries are Tenmile River, a stream lying almost entirely in New York State and entering the river near Gaylordsville, and Naugatuck River, with a drainage area of 313 square miles, which enters at Birmingham and is entirely in the State of Connecticut. In the vicinity of Pittsfield the Housatonic reaches an elevation of about 1,500 feet, this being a hilly and mountainous region. Through Connecticut the river in general runs through a wide valley, much of which is in farm land. In most places the bed of the river is of gravel, but in a few localities there are falls over ledges of limestone and granite. The basin is to some extent in forest cover, especially in its upper portions, but as a whole it may be said to consist largely of farm lands.

The mean annual precipitation is probably about 43 inches. In the upper portion of the basin the winters are severe, but as a whole the area is sufficiently far south so that the river is open during a considerable part of the winter season.

In the whole drainage basin there are some 15 square miles of lake and pond surface, but generally speaking storage has been very little developed and there are numerous opportunities for improvements of this nature.

Power has been developed at Birmingham, New Milford, and recently at Bulls Bridge above Gaylordsville, and at a number of other places, but there remains considerable unutilized power both on the main river and its tributaries.

HOUSATONIC RIVER AT GAYLORDSVILLE, CONN.

This station, which is located at the covered wooden highway bridge at Gaylordsville, about 2 miles below the mouth of Tenmile River, was established October 24, 1900.

Downstream the nearest dam is at New Milford, about 7 miles below the station; upstream the nearest dam is at Bulls Bridge. At high stages backwater from the dam below may slightly affect the relation between gage height and discharge.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station. The observer is paid by the United States Weather Bureau from November to April.

On account of the poor cross section at the bridge discharge measurements are made from a cable 1¼ miles below, or by wading.

The discharge is affected by ice during short periods of the winter.

Conditions for obtaining accurate discharge measurements are good and a good discharge rating curve has been developed.

Only one reading is taken each day at this station and, as is indicated by the low Sunday readings, the low-stage flow is greatly controlled by the power plants above, and consequently the daily gage heights do not correctly represent the averages for 24-hour periods.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

The following discharge measurement made in 1910 by W. G. Hoyt indicates that no change has occurred in conditions of flow:

Oct. 13: Width, 140 feet; area, 287 square feet; gage height, 3.05 feet; discharge, 308 second-feet.

HUDSON RIVER.

GENERAL FEATURES OF AREA DRAINED.

The principal sources of Hudson River lie in the wildest portion of the Adirondack Mountains, in Essex County, northeastern New York. A number of branches, any one of which might possibly be considered the main stream, form its upper waters; but if the highest collected and permanent body of water be assumed as the true head, then the source of the Hudson becomes Lake Tear-of-the-Clouds, which lies at an elevation of 4,322 feet above sea level, in the center of the triangle formed by Mounts Marcy and Skylight and Gray Peak.

The river flows rather deviously southward until it reaches the northern boundary of Saratoga County, where it makes a sharp turn and thence flows eastward about 12 miles, passing through the mountains and forming, as it cuts across the rocky strata, several falls of great height and beauty. At Sandy Hill, just below Glens Falls, it makes another abrupt turn and thence flows southward, continuing in this direction until it empties into New York Bay.

From Lake Tear-of-the-Clouds to the mouth of the river the distance by water is probably about 300 miles. The total area drained is 13,366 square miles. The river is tidal to Troy, at the head of navigation.

The headwater region is mountainous in character, is in general heavily wooded, and is dotted with numerous lakes and ponds. The rocks, belonging to the oldest formation and mainly granitic, are either bare or covered only with a layer of spruce duff, humus, and forest litter. The river emerges from the mountain region a few

miles west of Glens Falls, and thence to Troy its valley is moderately rolling and the surface soil is chiefly sand. Below Troy the river follows the great depression which extends almost due north and south between New York Bay and the St. Lawrence, flowing in an open valley bordered by well-cultivated lands, which rise with moderate slope from the stream. The Catskill Mountain region is reached 20 or 30 miles below Albany, and thence to the mouth of the river the immediate valley is flanked by high hills, the Highlands of Orange County and the precipitous Palisades being especially noticeable.

The fall in the upper portion of the course is very rapid, amounting to about 64 feet per mile from Lake Tear-of-the-Clouds to the mouth of North Creek, a distance of about 52 miles. From the mouth of North Creek to the mouth of the Sacandaga the descent is nearly 14 feet per mile, distributed among rapids which diminish in frequency as the Sacandaga is approached. In the succeeding 26 miles to Fort Edward the river descends 418 feet more, but 175 feet of this is comprised within the three abrupt pitches at Palmer, Glens, and Bakers falls, and most of the remainder occurs in the rapids between Jessups Landing and the oxbow above Glens Falls. Between Glens Falls and Troy nearly the entire fall of the river is utilized for the development of water power.

The tributaries of the Hudson are numerous, and many of them are large and important. Indian River, Schroon River, and the Sacandaga unite with the main stream above Glens Falls, and between the latter point and Troy the river receives Battenkill River, Fish Creek, Hoosic River, and the Mohawk, the latter having several important tributaries, including West and East Canada and Schoharie creeks. The tributaries below Troy include Catskill, Esopus, and Rondout creeks and Wallkill River from the west, and Kinderhook Creek, Jansen Kill, Wappinger Creek, Fishkill Creek, and Croton River from the east.

The mean annual precipitation on the total basin of the Hudson is probably about 43 inches. It reaches a maximum of more than 55 inches in the heights of the Adirondacks, while in the eastern portion of the drainage area in southern Vermont the mean annual total is only about 39 inches. Conditions during the winter period range from the extreme cold and deep snow of the Adirondacks to the frequent winter thaws in the southern part of the basin.

The flow of the upper Hudson is controlled to some extent during the dry season by the use of Indian Lake storage reservoir, and the natural storage facilities in the Adirondack region are unsurpassed, including many large ponds and lakes fed from extensive drainage areas. Comprehensive plans for vast storage projects on the Sacandaga, Schroon, and upper Hudson are receiving the attention of the

New York State Water Supply Commission. It is probable that on the various tributaries of the Hudson an increase in storage capacity of some 75 billion cubic feet is possible, and if this were developed the Hudson would be probably the most important water-power stream in the country. Although a large amount of power has been developed in the Hudson drainage area, vast quantities are still unutilized, and the importance of this river basin is apparent when it is considered that in proportion to its size it contains a greater population than any other important drainage basin in the United States, with the single exception of that of the Delaware River.

The longest run-off record in the Hudson River drainage basin is that obtained at Mechanicville, which extends back to 1888.

HUDSON RIVER AT NORTH CREEK, N. Y.

This station, which is located on the steel highway bridge at North Creek, was established, in cooperation with the New York State Water Supply Commission, September 21, 1907.

North Creek, a small tributary of the Hudson, enters from the right a short distance below this point.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station.

All discharge measurements are made from the bridge.

During the winter months the discharge is affected by ice.

Conditions for obtaining accurate discharge are good, and a very good discharge rating curve has been developed.

The regimen of flow of the upper Hudson, especially during the low-water season, is considerably affected by storage in Indian Lake Reservoir. (See Indian Lake Reservoir at Indian Lake.)

Information in regard to this station is contained in the annual reports of the State Water Supply Commission of New York, and the State engineer and surveyor, State of New York.

Discharge measurements of Hudson River at North Creek, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 19 *a*	W. G. Hoyt	240	320	3.32	276
Feb. 16 *b*	C. C. Covert	252	556	4.60	652
Apr. 2	W. G. Hoyt	247	1,680	7.23	9,980
6	do	248	1,070	5.08	4,200
21	do	248	778	3.80	1,900
June 17	Covert & Phelan	248	668	3.48	1,420
July 12	W. A. James	238	480	2.62	645
Nov. 11	F. J. Shuttleworth	242	530	3.01	835
Dec. 31 *c*	do	210	440	3.02	556

a Measurement made under complete ice cover. Gage height to top of ice, 3.35 feet; average thickness of ice, 1.3 feet.

b Measurement made under complete ice cover. Gage height to top of ice, 4.93 feet; average thickness of ice, 1.95 feet.

c Measurement made under partial ice cover. Gage height to top of ice, 3.03 feet; average thickness of ice, 1.2 feet.

Daily gage height, in feet, of Hudson River at North Creek, N. Y., for 1910.

[Gilbert Dean, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.01	.....	.....	7.20	3.90	4.65	2.52	2.92	3.05	2.95	3.55	2.90
2	.....	.....	.....	7.15	4.22	4.40	2.49	2.86	3.22	2.78	3.50	2.89
3	.....	.....	6.3	6.25	4.52	3.98	2.45	2.88	3.15	2.69	3.50	2.95
4	.....	.....	6.55	5.50	5.25	3.78	2.42	3.12	3.20	2.64	3.48	2.92
5	.....	4.41	5.75	5.35	5.08	3.72	2.37	3.40	3.20	2.64	3.18	2.85
6	.....	.....	5.15	5.35	4.58	4.00	2.34	3.20	3.37	2.63	3.45	2.80
7	.....	.....	5.17	5.42	4.62	4.57	2.30	3.05	3.55	3.35	3.45	2.78
8	3.12	.....	5.19	5.72	4.52	4.79	2.30	2.82	3.62	3.28	3.25	2.98
9	.....	.....	5.02	4.75	5.08	4.67	2.27	2.70	3.50	3.20	3.10	3.00
10	.....	.....	4.78	4.20	4.28	4.37	2.24	2.80	3.42	3.24	3.00	3.00
11	.....	.....	4.60	4.62	4.45	4.15	2.21	3.38	3.25	3.28	2.95	3.02
12	.....	4.52	4.44	4.75	3.70	4.19	2.68	4.00	3.10	3.22	2.98	2.85
13	.....	.....	4.12	4.28	3.48	4.07	2.68	3.58	3.04	3.22	2.90	2.75
14	.....	.....	3.95	4.01	3.52	3.85	2.65	3.32	3.02	3.20	2.84	2.82
15	3.12	.....	3.85	3.00	3.35	3.72	2.60	3.00	2.98	3.12	2.79	2.87
16	.....	4.60	3.68	3.88	3.15	3.57	2.64	3.30	2.90	3.05	2.75	2.82
17	.....	.....	3.61	2.72	3.02	3.46	2.64	3.20	2.84	3.02	2.70	2.75
18	.....	.....	3.50	3.48	2.92	3.64	2.64	3.20	2.80	3.02	2.60	2.85
19	3.32	4.50	3.48	3.85	3.00	3.75	2.60	3.15	2.78	3.18	2.54	2.90
20	.....	.....	3.42	5.98	3.02	3.55	2.60	3.08	2.76	3.20	2.40	3.00
21	.....	.....	3.50	4.52	3.26	3.48	2.60	2.95	2.76	3.18	2.28	2.88
22	4.25	.....	3.66	3.68	3.32	3.30	2.61	2.95	2.80	3.22	2.92	2.88
23	.....	.....	4.18	4.28	3.45	3.10	2.60	2.95	2.77	3.25	2.95	2.90
24	.....	.....	4.18	3.38	3.35	2.98	2.60	2.90	2.75	3.20	2.95	2.90
25	.....	.....	5.40	3.68	3.68	2.88	2.60	2.84	2.74	3.28	2.95	2.95
26	.....	4.80	6.30	3.22	4.84	2.78	2.59	2.81	2.79	3.35	2.94	3.00
27	.....	.....	5.90	4.90	5.45	2.75	2.56	2.80	2.85	3.60	2.98	3.15
28	.....	.....	5.55	3.50	4.68	2.70	2.62	2.80	3.36	3.70	2.92	3.10
29	5.01	.....	6.12	3.18	4.25	2.62	2.90	2.79	3.40	3.80	2.90	3.05
30	.....	.....	6.82	5.42	4.05	2.55	2.85	2.76	3.15	3.72	2 91	3.02
31	.....	.....	7.08	.....	4.28	.....	2.92	2.75	.....	3.70	.....	3.08

NOTE.—Relation of gage height to discharge affected by the presence of ice and by backwater from log jams from Jan. 1 to about Mar. 22, and from about Dec. 8 to 31.

Gage read to top of ice Mar. 3 to 22, and to water surface for the rest of the period during which ice was present.

Relation of gage height to discharge may also have been affected by log jams at intervals during the remainder of the year, particularly through May.

Daily discharge, in second-feet, of Hudson River at North Creek, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	9,790	2,080	3,380	474	810	940	840	1,550	790
2	.....	.....	.....	9,640	2,600	2,920	454	754	1,120	682	1,480	780
3	.....	.....	.....	7,080	3,140	2,210	430	772	1,040	602	1,480	840
4	.....	.....	.....	5,200	4,630	1,890	412	1,010	1,100	562	1,450	810
5	.....	.....	.....	4,860	4,260	1,800	382	1,350	1,100	562	1,080	745
6	.....	.....	.....	4,860	3,250	2,240	364	1,100	1,310	554	1,420	700
7	.....	.....	.....	5,020	3,330	3,230	340	940	1,550	1,280	1,420	682
8	.....	.....	.....	5,730	3,140	3,660	340	718	1,650	1,200	1,160	.....
9	.....	.....	.....	3,580	4,260	3,420	325	610	1,480	1,100	990	.....
10	.....	.....	.....	2,570	2,710	2,870	310	700	1,380	1,150	890	.....
11	.....	.....	.....	3,330	3,010	2,480	295	1,320	1,160	1,200	840	.....
12	.....	.....	.....	3,580	1,770	2,550	594	2,240	990	1,120	870	.....
13	.....	.....	.....	2,710	1,450	2,350	594	1,590	930	1,120	790	.....
14	.....	.....	.....	2,260	1,500	2,000	570	1,250	910	1,100	736	.....
15	.....	.....	.....	890	1,280	1,800	530	890	870	1,010	691	.....
16	.....	.....	.....	2,050	1,040	1,580	562	1,220	790	940	655	.....
17	.....	.....	.....	628	910	1,430	562	1,100	736	910	610	.....
18	.....	.....	.....	1,450	810	1,680	562	1,100	700	910	530	.....
19	.....	.....	.....	2,000	890	1,840	530	1,040	682	1,080	488	.....
20	.....	.....	.....	6,380	910	1,550	530	970	664	1,100	400	.....
21	.....	.....	.....	3,140	1,170	1,450	530	840	664	1,080	330	.....
22	.....	.....	.....	1,740	1,250	1,220	538	840	700	1,120	810	.....
23	.....	.....	2,540	2,710	1,420	990	530	840	673	1,160	840	.....
24	.....	.....	2,540	1,320	1,280	870	530	790	655	1,220	840	.....
25	.....	.....	5,200	1,740	1,740	772	530	736	646	1,200	840	.....

Daily discharge, in second-feet, of Hudson River at North Creek, N. Y., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	.....	.....	7,220	1,120	3,760	682	523	709	691	1,280	830	.....
27	.....	.....	6,180	3,880	5,080	655	502	700	745	1,620	870	.....
28	.....	.....	5,320	1,480	3,440	610	546	700	1,300	1,770	810	.....
29	.....	.....	6,740	1,080	2,660	546	790	691	1,350	1,920	790	.....
30	.....	.....	8,650	5,020	2,320	495	745	664	1,040	1,800	800	.....
31	.....	.....	9,430	.....	2,710	.....	810	655	.....	1,770	.....	.....

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

The daily discharge for Jan. 1 to Mar. 22 and Dec. 8 to 31 has not been published in the Federal report because it is only approximate.

Monthly discharge of Hudson River at North Creek, N. Y., for 1910.

[Drainage area, 804 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	593	0.738	0.85	C.
February	.....	.....	677	.842	.88	C.
March	9,430	.....	3,640	4.53	5.22	C.
April	9,790	628	3,560	4.43	4.94	A.
May	5,080	810	2,380	2.96	3.41	A.
June	3,660	495	1,840	2.29	2.56	A.
July	810	295	508	.632	.73	A.
August	2,240	610	956	1.19	1.37	A.
September	1,650	646	986	1.23	1.37	A.
October	1,920	554	1,130	1.41	1.63	A.
November	1,550	330	910	1.13	1.26	A.
December	.....	.....	570	.709	.82	C.
The year	9,790	295	1,480	1.84	25.04	

NOTE.—Discharge Jan. 1 to Mar. 22 and Dec. 8–31, estimated by means of two measurements made with ice present, climatologic records, consideration of storage, and comparison of the discharge with that at other stations.

Mean discharge Jan. 1 to 21, estimated, 361 second-feet; practically constant.

Mean discharge Jan. 22 to 31, estimated, 1,080 second-feet, ranging from 1,800 to 700 second-feet.

Daily discharge during February practically constant.

Mean discharge Mar. 1 to 22, estimated, 2,690 second-feet, ranging from 6,000 to 1,200 second-feet.

Mean discharge Dec. 8 to 31, estimated, 514 second-feet.

Daily discharge Dec. 8 to 31 nearly constant.

The discharge for February was increased over 100 second-feet by draft on Indian Lake storage. Similarly discharge Nov. 22 to 30 was increased over 300 second-feet and that for December was increased 240 second-feet.

Comparisons with Schroon River and Hudson River at Thurman indicate that the monthly discharge for May may be too high.

Determinations of discharge for January, March, November, and December have been revised, and supersede those published in the Sixth Annual Report of the New York State Water Supply Commission and the 1910 report of the New York State engineer and surveyor.

HUDSON RIVER AT THURMAN, N. Y.

This station, which is located on the Delaware & Hudson Railroad bridge leading from Thurman to Warrensburg, about 950 feet below the highway bridge to Warrensburg and some 2,000 feet below the entrance of Schroon River into the Hudson, was established, in cooperation with the New York State Water Supply Commission, September 22, 1907.

There is a dam on Schroon River at Warrensburg, about 3 miles above the station. On the Hudson there is a dam at Luzerne, about 12 miles below.

During the winter months the discharge is affected by ice and the station temporarily discontinued by the Survey, but is usually maintained by the United States Weather Bureau.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station.

All discharge measurements are made from the bridge.

Conditions for obtaining accurate discharge data are excellent, and a very good discharge rating curve has been developed.

The regimen of flow of the upper Hudson, especially during the low-water season, is considerably affected by storage in Indian and Schroon Lake reservoirs. (See Indian Lake reservoir at Indian Lake and Schroon Lake at Pottersville.)

Gage heights from January 1 to March 26 and December 1–31 are taken from Part X of "Daily river stages," published by the United States Weather Bureau.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York.

Discharge measurements of Hudson River at Thurman, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 1	W. G. Hoyt	312	2,050	7.14	15,200
2	.....do	315	2,120	7.28	15,400
5	.....do	308	1,580	5.69	9,300
21	.....do	284	1,200	4.21	4,580
21	.....do	293	1,280	4.30	4,850
June 16	Covert and Phelan	279	1,050	3.76	3,270
Aug. 7	Phelan and Carman	261	789	2.80	1,330
Nov. 1	J. J. Phelan	270	881	3.23	1,950

Daily gage height, in feet, of Hudson River at Thurman, N. Y., for 1910.

[S. H. Spencer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.0	4.2	6.8	7.25	4.02	4.76	2.78	2.60	2.71	2.85	3.22	2.8
2	.....	4.1	7.2	7.37	4.63	4.60	2.49	2.66	2.91	2.69	3.17	2.7
3	3.2	4.0	7.3	6.52	3.72	4.30	2.36	2.46	2.92	2.73	3.18	2.7
4	.....	3.8	7.1	6.05	4.35	4.10	2.34	2.85	2.89	2.64	3.19	2.6
5	3.0	3.9	6.9	5.98	4.23	3.94	2.69	3.03	2.97	2.65	3.26	2.6
6	3.0	3.8	6.7	5.42	4.51	4.34	2.59	2.89	3.00	2.56	3.34	2.7
7	3.2	3.8	7.2	5.71	4.24	4.75	2.56	2.70	3.14	3.00	3.30	2.7
8	3.8	4.0	7.8	5.90	4.50	4.79	2.52	2.62	3.34	2.96	3.21	4.1
9	.....	4.1	7.2	5.16	4.25	4.70	2.37	2.48	3.13	2.94	3.56	4.0
10	3.2	4.3	6.7	4.72	4.37	4.66	2.28	2.38	3.08	3.01	3.02	3.9
11	3.3	4.4	6.5	4.27	4.34	4.37	2.35	2.64	2.93	2.99	2.92	3.7
12	3.3	4.4	6.0	4.61	3.88	4.38	2.33	3.38	2.90	2.91	2.87	3.6
13	3.3	4.3	5.5	4.31	3.67	4.27	2.57	3.19	2.82	2.95	2.76	3.3
14	3.3	4.2	4.2	3.74	3.67	4.07	2.49	3.75	2.75	2.97	2.75	3.3
15	.....	4.1	4.1	3.89	3.64	3.91	2.46	2.76	2.64	2.90	2.80	3.6
16	.....	4.0	4.0	4.09	3.38	3.73	2.35	2.86	2.57	2.78	2.78	3.2
17	3.2	4.2	3.8	3.52	3.27	3.73	2.28	2.88	2.59	2.80	2.66	3.4
18	3.1	4.4	3.7	3.42	3.31	3.72	2.50	2.87	2.60	2.82	2.53	3.5
19	3.3	4.4	3.6	4.37	3.14	4.12	2.50	2.86	2.68	2.91	2.51	3.7
20	.....	4.5	3.6	6.00	3.08	3.68	2.48	2.69	2.56	2.95	2.48	3.8

Daily gage height, in feet, of Hudson River at Thurman, N. Y., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	3.4	4.5	3.6	4.67	3.34	3.58	2.46	.....	2.56	2.94	2.41	3.8
22	.....	4.6	.....	4.41	3.27	3.45	2.44	2.46	2.62	2.86	2.51	3.4
23	.....	4.6	4.2	4.76	3.37	3.30	2.41	2.58	2.55	2.90	2.78	3.7
24	.....	4.5	4.6	4.42	3.40	3.13	2.23	2.58	2.57	3.02	2.77	3.8
25	5.1	4.5	5.2	.....	3.72	3.06	2.41	2.58	2.65	3.04	2.74	3.7
26	5.0	4.5	6.2	.....	4.70	2.98	2.37	2.52	2.71	3.01	2.71	3.7
27	4.8	4.6	5.90	.....	4.69	2.95	2.30	2.46	2.76	3.27	2.72	4.0
28	4.7	5.5	5.92	.....	4.51	2.94	2.28	2.29	3.36	3.33	2.68	3.9
29	4.5	.....	6.33	.....	4.24	2.92	2.52	2.52	3.29	3.36	2.74	3.8
30	.....	.....	6.85	.....	4.26	2.87	2.43	2.50	3.15	3.34	2.79	4.0
31	4.4	.....	7.19	.....	4.60	.....	2.60	2.47	.....	3.34	.....	3.7

NOTE.—Ice present at this station from Jan. 1 to about Mar. 22 and from about Dec. 8–31. It is not known whether readings during this period were to water surface or to the top of the ice.

Gage heights Jan. 1 to Mar. 26 and Dec. 1–31 taken from Daily river stages, Part X, United States Weather Bureau.

Daily discharge, in second-feet, of Hudson River at Thurman, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	15,400	4,070	6,220	1,260	1,000	1,160	1,380	2,110	1,300
2	.....	.....	.....	15,900	5,830	5,740	864	1,080	1,490	1,130	2,010	1,140
3	.....	.....	.....	12,500	3,280	4,860	720	829	1,510	1,200	2,030	1,140
4	.....	.....	.....	10,600	5,000	4,290	700	1,380	1,450	1,060	2,050	1,000
5	.....	.....	.....	10,400	4,660	3,850	1,130	1,720	1,600	1,070	2,200	1,000
6	.....	.....	.....	8,350	5,470	4,980	988	1,450	1,660	950	2,380	1,140
7	.....	.....	.....	9,380	4,690	6,190	950	1,140	1,940	1,660	2,290	1,140
8	.....	.....	.....	10,100	5,440	6,310	900	1,030	2,380	1,580	2,090	.....
9	.....	.....	.....	7,480	4,720	6,040	730	852	1,920	1,550	2,890	.....
10	.....	.....	.....	6,100	5,060	5,920	643	740	1,820	1,680	1,700	.....
11	.....	.....	.....	4,770	4,980	5,060	710	1,060	1,530	1,640	1,510	.....
12	.....	.....	.....	5,770	3,690	5,090	690	2,470	1,470	1,490	1,420	.....
13	.....	.....	.....	4,890	3,160	4,770	962	2,050	1,330	1,560	1,230	.....
14	.....	.....	.....	3,330	3,160	4,210	864	3,360	1,220	1,600	1,220	.....
15	.....	.....	.....	3,710	3,090	3,770	829	1,230	1,060	1,470	1,300	.....
16	.....	.....	.....	4,260	2,470	3,300	710	1,400	962	1,260	1,260	.....
17	.....	.....	.....	2,800	2,220	3,300	643	1,440	988	1,300	1,080	.....
18	.....	.....	.....	2,570	2,310	3,280	875	1,420	1,000	1,330	912	.....
19	.....	.....	.....	5,060	1,940	4,350	875	1,400	1,110	1,490	888	.....
20	.....	.....	.....	10,500	1,820	3,180	852	1,130	950	1,560	852	.....
21	.....	.....	.....	5,950	2,380	2,940	829	980	950	1,550	772	.....
22	.....	.....	.....	5,180	2,220	2,640	806	829	1,030	1,400	888	.....
23	.....	.....	4,570	6,220	2,450	2,290	772	975	938	1,470	1,260	.....
24	.....	.....	5,740	5,210	2,520	1,920	600	975	962	1,700	1,250	.....
25	.....	.....	7,610	5,040	3,280	1,780	772	975	1,070	1,740	1,200	.....
26	.....	.....	11,200	4,870	6,040	1,620	730	900	1,160	1,680	1,160	.....
27	.....	.....	10,100	4,710	6,010	1,560	660	829	1,230	2,220	1,170	.....
28	.....	.....	10,200	4,550	5,470	1,550	643	652	2,430	2,360	1,110	.....
29	.....	.....	11,700	4,390	4,690	1,510	900	900	2,270	2,430	1,200	.....
30	.....	.....	13,800	4,230	4,740	1,420	794	875	1,960	2,380	1,280	.....
31	.....	.....	15,200	.....	5,740	.....	1,000	840	.....	2,380	.....	.....

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Discharge interpolated Apr. 25 to 30 and Aug. 21.

The daily discharge for Jan. 1 to Mar. 22 and Dec. 8–31 not published, because it is only approximate.

Monthly discharge of Hudson River at Thurman, N. Y., for 1910.

[Drainage area, 1,550 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	900	0.581	0.67	C.
February	.....	.....	1,200	.774	.81	C.
March	15,200	.....	6,500	4.19	4.83	C.
April	15,900	2,570	6,810	4.39	4.90	A.
May	6,040	1,820	3,950	2.55	2.94	A.
June	6,310	1,420	3,800	2.45	2.73	A.
July	1,260	600	819	.528	.61	A.
August	3,360	652	1,220	.787	.91	A.
September	2,430	938	1,420	.916	1.02	A.
October	2,430	950	1,590	1.03	1.19	A.
November	2,890	772	1,490	.961	1.07	A.
December	.....	.....	860	.555	.64	C.
The year	15,900	600	2,550	1.65	22.32	

NOTE.—Discharge for January, February, March, and December estimated from the combined flow at North Creek and Riverbank, plus an estimated inflow between Thurman and North Creek and Riverbank, due consideration being given to the effect of storage regulation at Indian Lake reservoir.

Discharge for January, February, and March revised, superseding that published in the sixth annual report of the New York State Water Supply Commission and the 1910 report of the New York State engineer and surveyor.

Discharge Jan. 1–21, Feb. 1–28, and Dec. 8–31 relatively constant.

Mean discharge Jan. 1–21 about 570 second-feet.

Mean discharge Jan. 22–31 about 1,600 second-feet, ranging approximately from 1,200 to 2,300 second-feet.

Mean discharge Mar. 1–22 about 5,070 second-feet, ranging approximately from 7,500 to 2,500 second-feet.

Mean discharge Dec. 8–31 about 784 second-feet.

HUDSON RIVER AT MECHANICVILLE, N. Y.

This station is located at the dam of the West Virginia Pulp & Paper Co. at Mechanicville, a few miles down the stream from the entrance of Hoosic River into the Hudson. Records have been kept at this point by this company since 1888, and the results for 1910 have been furnished by R. P. Bloss, engineer of the company. The dam at Mechanicville was rebuilt in 1904 and now has a rounded or ogee section. A discharge curve has been calculated, using a coefficient of discharge derived from United States Geological Survey experiments on models of dams of ogee cross section, as published in Water-Supply Paper 200.

During 1910 an automatic gage was installed at this station for the purpose of obtaining more accurate readings of the depth on the crest of the dam.

The discharge of the Hudson at Mechanicville is diminished somewhat by water required in operating the Champlain canal.

Records at this station are under careful supervision.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York.

The following test-discharge measurements were made during 1910:

Discharge measurements of Hudson River at Mechanicville, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 9	C. C. Covert	475	6,550	4.08	22,000
June 1	W. G. Hoyt	474	5,920	2.63	17,300
14	Covert and Phelan	476	5,610	2.14	13,700
July 22	J. J. Phelan	443	4,560	.06	1,700
Aug. 13	do	430	4,930	1.02	2,900
Sept. 27	do	472	5,010	.68	2,130
Dec. 2	do	464	4,960	1.00	2,970

NOTE.—Measurements made from toll bridge just below the dam of the West Virginia Pulp & Paper Co. at Mechanicville. Construction work in connection with the barge canal affected the conditions of flow somewhat.

Daily discharge, in second-feet, of Hudson River at Mechanicville, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,533	5,570	31,537	35,906	a15,760	14,750	3,615	2,625	1,370	4,395	3,885	2,943
2	a1,331	4,247	30,930	36,054	11,459	14,665	3,588	1,562	1,238	a3,224	3,453	2,467
3	1,369	4,293	29,683	a37,809	11,422	12,967	a700	1,646	1,490	3,698	3,582	2,288
4	804	4,258	29,988	29,819	9,715	11,628	1,284	1,459	a809	2,880	3,667	a2,194
5	925	3,904	28,355	25,540	12,996	a8,173	2,979	2,333	1,488	2,274	4,059	2,499
6	1,745	a2,550	a25,211	23,072	12,485	14,025	2,640	2,402	2,658	2,314	a3,477	1,668
7	2,806	4,915	28,962	23,409	11,353	16,010	2,255	a2,425	2,807	2,281	6,071	2,190
8	2,163	3,814	29,088	23,808	a9,367	17,227	1,949	3,365	2,685	1,533	5,082	1,805
9	a1,982	3,345	24,586	23,659	11,015	16,959	1,742	2,355	2,899	a1,664	4,513	1,745
10	1,928	2,742	22,302	a17,722	9,227	15,728	a812	1,796	3,261	2,770	4,394	1,834
11	1,883	2,745	19,691	16,128	9,563	14,300	1,631	2,498	a3,400	3,557	3,692	a544
12	1,489	3,106	18,559	13,510	8,527	a14,028	1,421	1,748	3,560	2,027	3,598	1,552
13	1,528	a3,170	a15,818	14,426	7,355	14,848	1,464	2,993	2,134	2,896	a2,310	1,240
14	1,864	5,765	17,295	12,555	6,176	12,791	1,463	a2,658	2,393	2,692	4,493	1,260
15	1,866	3,344	14,250	9,997	a4,534	11,450	1,430	2,758	2,717	2,702	3,202	1,468
16	a2,134	3,858	12,778	9,429	7,166	9,759	1,385	2,061	2,701	a1,378	2,570	1,448
17	1,433	3,156	11,774	a8,469	5,696	8,896	a800	2,097	2,075	2,725	2,919	1,780
18	1,720	4,032	10,603	8,014	5,228	9,046	1,595	2,165	a345	2,388	3,013	a1,129
19	2,638	3,381	9,193	8,830	5,008	a8,827	1,394	2,555	2,080	1,765	2,130	1,466
20	4,583	a2,483	a9,684	13,313	4,795	9,760	1,328	2,527	1,766	1,926	a1,180	1,780
21	2,733	3,577	12,197	18,413	5,345	7,546	1,332	a796	1,604	1,242	2,533	1,376
22	31,151	5,528	12,314	14,457	a5,450	6,761	1,412	1,874	1,595	1,542	2,370	1,725
23	a15,692	6,002	12,622	12,279	7,341	6,078	1,465	2,389	1,429	a900	2,159	1,432
24	12,370	5,227	14,714	a12,885	6,312	5,425	a530	1,488	1,541	1,846	2,523	1,492
25	11,513	5,276	16,946	11,827	6,681	4,872	1,382	1,185	a1,036	3,548	2,098	a764
26	11,644	4,694	27,319	10,360	9,397	a3,283	1,395	1,629	1,987	2,800	4,771	3,234
27	8,514	a10,742	a28,173	16,735	13,668	5,064	1,473	2,212	1,537	2,584	a2,181	2,555
28	8,295	37,655	28,924	16,363	13,964	3,825	1,406	a867	2,744	3,335	2,799	3,191
29	7,358	.....	27,375	13,283	a11,823	3,539	1,701	867	4,737	2,471	3,712	3,791
30	a6,822	.....	29,529	11,221	12,297	3,064	1,410	1,180	6,143	a3,152	2,069	3,746
31	7,135	.....	33,162	.....	14,981	.....	a717	1,243	.....	4,289	.....	3,601

a Sunday.

Monthly discharge of Hudson River at Mechanicville for 1910.

[Drainage area, 4,500 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	31,200	804	5,190	1.15	1.33
February	37,700	2,480	5,480	1.22	1.27
March	33,200	9,190	21,400	4.76	5.49
April	37,800	8,010	17,600	3.91	4.36
May	15,800	4,530	9,230	2.05	2.36
June	17,200	3,000	10,200	2.27	2.53
July	3,620	530	1,600	.356	.41
August	3,300	796	1,990	.442	.51
September	6,140	345	2,270	.504	.56
October	4,400	900	2,540	.564	.65
November	6,070	1,180	3,280	.729	.81
December	3,790	544	2,010	.447	.52
The year	37,700	345	6,900	1.53	20.80

CHAMPLAIN CANAL AND GLENS FALLS FEEDER, N. Y.

The discharge of Hudson River at both Fort Edward and Mechanicville is diminished somewhat by the water required for operating the Champlain canal. In the northern stretch of this canal—from Northumberland to Lake Champlain, at Whitehall—the summit level (between Fort Edward and Fort Ann) is supplied (1) by the Glens Falls feeder, a branch canal leaving the Hudson about 2 miles above Glens Falls, and (2) by Wood Creek.

At Northumberland the canal crosses the Hudson and the southern portion receives its principal water supply here.

The quantity of water diverted from Hudson River for the Champlain canal has been measured occasionally during 1910 at various points, and a summary of the measurements follows:

Measurements of flow in Champlain canal, Glens Falls feeder, and spillways in 1910.

Date.	Locality.	Mean velocity (feet per second).	Discharge (second-feet).	Remarks.
	BELOW NORTHUMBERLAND.			
June 2	Champlain canal at Mechanicville	0.38	91.2	From Saratoga Street bridge.
2	Spillway near Mechanicville	.....	*a* 3	This spillway is about 250 yards above mill of West Virginia Pulp Co., at Mechanicville; 90 feet across; water flowing over about ½ inch deep.
2	Bridge 34, Stillwater	.60	115	
2	Spillway below bridge 34	.....	*a* 7	
2	Schuyler Creek near Stillwater	.33	39	Schuyler Creek flows into the canal opposite the Stillwater spillway. No measurement of this creek could be made, but flow was estimated at 10 or 15 second-feet.
2	Spillway at Bemis	.....	*a* 5	From bridge at Stillwater.
2	Bridge 45, below Coveville	.62	170	From bridge opposite W. F. Curtis's.
3	Coveville foot bridge	.48	127	From bridge behind Coveville post office.

a Estimated.

Measurements of flow in Champlain canal, Glens Falls feeder, and spillways in 1910—Con.

Date.	Locality.	Mean velocity (feet per second).	Discharge (second feet).	Remarks.
	BELOW NORTHUMBERLAND—contd.			
June 3	Spillway below Coveville	.....	[a] 5	Spillway just above bridge No. 51; estimated flow, 1 second-foot.
3	Spillway (small) 75 yards below Coveville.	.....	[a] 5	
3	Champlain canal, Schuylerville	0.54	183	From bridge No. 63; 3 spillways just below this bridge.
3	Spillway below Schuylerville	.....	[a] 5	Between bridges Nos. 46 and 47. Not sufficient flow for measurement; flow estimated 5 to 8 second-feet.
3	Lock at head of canal	.....	[a] 5	Lock not in use at this time. Estimated leakage, 46 second-feet.
21	Champlain canal at Mechanicville	.30	75.4	From Saratoga Street bridge.
July 21	.....do	.72	164	Do.
Aug. 13	.....do	.23	60.5	Do.
Sept. 26	.....do	.38	88	Do.
	ABOVE NORTHUMBERLAND.			
June 3	Lock at end of canal	.....	[a] 5	Estimated leakage, 3 to 5 second-feet.
4	Champlain canal at Fort Edward	.42	110	At East Street bridge.
3	Glens Falls feeder, Hudson Falls	.97	195	Brown Bridge.
4	Spillway above Fort Edward	.....	[a] 5	From bridge 45 feet north of entrance of Glens Falls feeder. Current runs north.
4	Champlain canal above feeder bridge No. 100.	.36	135	There is but one bridge between Fort Edward and Glens Falls feeder, about 150 yards above Fort Edward Lock; barely a trace of current in canal; estimated flow over lock gates, 10 to 12 second-feet. Between Fort Edward and Glens Falls feeder is 1 small waste weir. Estimated flow, 1 second-foot.
4	Glens Falls feeder above Glens Falls	.87	216	At change bridge near feed dam, Glens Falls.
15	Champlain canal, Maple Street bridge above bridge No. 100.	.22	74.5	See remarks on measurement made June 4 at this point.
15	Glens Falls feeder above Glens Falls	.75	177	At change bridge near feed dam.
Aug. 12	Glens Falls feeder, Hudson Falls	.56	123	From change bridge west of trolley line at Hudson Falls.
12	Glens Falls feeder, Glens Falls	.77	208	At plate-girder highway bridge at Glens Falls.
Sept. 26	Glens Falls feeder, Hudson Falls	.79	182	From change bridge west of trolley line.
26	Glens Falls feeder, Glens Falls	.71	190	At plate-girder highway bridge.
Oct. 14	Glens Falls feeder, Hudson Falls	.88	188	At change bridge near feed dam.
14	Glens Falls feeder, Glens Falls	.83	210	At plate-girder highway bridge.

[a] Estimated.

From the foregoing table it appears that an average of about 200 second-feet passes under the first change bridge on the Glens Falls feeder above Glens Falls and an average of 170 second-feet under the Ferry Street bridge at Hudson Falls. This indicates that about 30 second-feet returns to Hudson River above Fort Edward and that about 170 second-feet enters Champlain canal and is diverted above Fort Edward. It is estimated that about 95 second-feet flows north toward Lake Champlain and is permanently diverted from the Hudson basin. The remaining 75 second-feet flows south and probably nearly all gets back into the Hudson at or above Northumberland.

The supply of water taken for the southern part of the canal below Northumberland is probably about 95 second-feet, which, with the

95 second-feet flowing north into Lake Champlain, makes a total of about 190 second-feet to be added to the recorded flow at Mechanicville.

It will be noted that the measurements were made at different times of the canal season, so that the usage is shown for the various periods and the average value given for the deductions.

In conclusion, it seems safe to assume that the following values are applicable during that portion of the year when the canal is in operation—May to November, inclusive: At Fort Edward add 170 second-feet to the recorded flow; at Mechanicville add 190 second-feet to the recorded flow.

These values are practically the same as found by Mr. Barrows in 1907, and as the measurements cover the period of operation of the canal, except for May and November, they are believed to be approximately correct; any great deviation therefrom would be temporary and due to lockage or breaks in the canal.

Results of discharge measurements to show diversion from Hudson River above Fort Edward and Mechanicville gaging stations, in 1910.

Date of measurement.	Feeder at—		Champlain canal.		
	Glens Falls.	Hudson Falls.	Fort Edward.	Above feeder.	Saratoga street, Mechanicville.
June 2, 3, 4	216	195	88	107	91
June 15–21	177	(160)	(72)	(88)	75
July 21	.....	.....	.....	.....	164
Aug. 12–13	208	123	55	68	60.5
Sept. 26	190	178	80	98	88
Oct. 14	210	188	85	103	(90)
Mean of observed quantities	200	170	.....	94	96

INDIAN LAKE RESERVOIR AT INDIAN LAKE, N. Y.

This station is located at a masonry storage dam at the outlet of Indian Lake. It was established July 22, 1900, to determine the total outflow from this reservoir. The drainage area at this point is 131 square miles, including about 9.3 square miles of water surface of Indian Lake at the elevation of the spillway of the dam.

The flow of the upper Hudson has been controlled to a considerable extent during the dry season by the use of Indian Lake reservoir since its completion in 1899. The total storage provided is about 4,700,000,000 cubic feet, which affords a discharge of nearly 600 second-feet for a period of 90 to 130 days each year.

The record at this station includes the elevation of the water surface in the reservoir, the depth of water flowing over the spillway or flashboards, the depth of opening and the head on the main and subsidiary logways, and the depth of the opening and the effective head on each of the 5-foot sluice gates. A meteorologic station

has also been established at the dam by the United States Weather Bureau, and records are kept of the rainfall, temperature, etc.

The crest of the dam is 106.05 feet long in the clear. To facilitate the calculation of discharge over the spillway a series of experiments was made at Cornell University in 1899 on a full-sized model of the spillway section, 6.58 feet long, from which the coefficient of discharge has been determined.

No computations of discharge have been made, pending some current-meter measurements to rate discharge through the gates, and at present the record of reservoir level alone is available.

The datum of the staff gage has remained the same during the maintenance of the station. The elevation of the spillway crest above mean sea level is 1,650 feet and 33.23 feet above the datum of the gage. Gage heights are obtained from the staff gage or by measuring down from a bench mark, which is at an elevation of 36 feet above the gage datum.

The maximum gage height of Indian Lake reservoir since the establishment of the station occurred April 27, 1908, and was 37.0 feet. The minimum gage height was 2.00 feet, and occurred from March 9 to 18, 1907, and from January 3–17, 1910.

Information in regard to this station is contained in reports of the State Water Supply Commission and of the State engineer and surveyor, State of New York.

Daily gage heights, in feet, of Indian Lake at Indian Lake, N. Y., for 1910.

[Lester Severie, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.17	6.25	6.17	21.00	30.96	34.75	34.29	30.79	27.92	23.46	16.83	16.08
2	2.08	6.42	7.83	21.79	31.13	34.79	34.25	30.58	27.67	23.54	16.67	15.92
3	2.00	6.54	9.08	22.42	31.46	34.75	34.25	30.38	27.42	23.67	16.50	15.75
4	2.00	6.62	9.83	23.00	31.88	34.71	34.21	30.62	27.17	23.79	16.50	15.58
5	2.00	6.75	10.42	23.42	32.25	34.71	34.12	30.67	26.92	23.88	16.62	15.42
6	2.00	6.88	10.75	23.92	32.38	34.88	34.12	30.62	26.75	23.71	16.79	15.25
7	2.00	7.00	11.08	24.33	32.50	35.08	34.00	30.71	26.58	23.54	16.88	15.04
8	2.00	6.96	11.54	24.67	32.63	35.21	33.96	30.79	26.42	23.46	17.04	14.75
9	2.00	6.88	12.21	25.00	32.71	35.21	33.92	30.83	26.17	23.29	17.17	14.58
10	2.00	6.66	12.58	25.13	32.79	35.17	33.88	30.75	25.92	23.08	17.25	14.46
11	2.00	6.46	12.75	25.33	32.92	35.13	33.83	30.83	25.67	22.83	17.33	14.33
12	2.00	6.25	12.92	25.50	33.00	35.17	33.67	30.92	25.38	22.58	17.42	14.21
13	2.00	6.08	13.08	25.63	33.08	35.17	33.42	31.00	25.25	22.38	17.50	14.04
14	2.00	5.88	13.25	25.75	33.13	35.08	33.29	31.08	25.00	22.17	17.58	13.88
15	2.00	5.66	13.42	25.88	33.17	35.04	33.17	31.17	24.75	22.00	17.67	13.71
16	2.00	5.50	13.62	26.13	33.21	35.00	33.04	31.21	24.50	21.83	17.75	13.54
17	2.00	5.29	13.79	26.25	33.25	34.92	32.92	31.08	24.25	21.67	17.83	13.38
18	2.08	5.08	13.92	26.50	33.33	35.00	32.79	30.83	24.04	21.42	17.92	13.21
19	2.17	4.88	13.04	27.67	33.46	35.00	32.67	30.67	23.88	21.08	18.60	13.04
20	2.17	4.67	14.00	28.42	33.58	35.00	32.54	30.50	23.75	20.75	18.04	12.88
21	2.29	4.46	14.08	28.92	33.67	34.92	32.42	30.29	23.54	20.42	17.96	12.71
22	2.62	4.25	14.20	29.25	33.83	34.83	32.29	30.08	23.38	20.08	17.75	12.51
23	2.96	4.04	14.38	29.42	33.92	34.75	32.17	29.88	23.17	19.75	17.54	12.38
24	3.79	3.83	14.54	29.54	34.00	34.67	32.04	29.62	22.96	19.42	17.38	12.20
25	4.75	3.62	15.17	29.67	34.17	34.58	31.92	29.42	22.75	19.08	17.21	12.08
26	5.16	3.42	16.00	30.00	34.46	34.50	31.79	29.21	22.75	18.75	17.04	11.96
27	5.42	3.50	16.67	30.33	34.58	34.42	31.67	29.00	22.75	18.42	16.88	11.83
28	5.58	4.67	17.25	30.50	34.58	34.38	31.50	28.79	22.96	18.17	16.67	11.71
29	5.75	.....	18.00	30.67	34.58	34.33	31.33	28.58	23.17	17.83	16.46	11.58
30	5.92	.....	18.83	30.83	34.58	34.33	31.17	28.46	23.38	17.50	16.25	11.46
31	6.08	.....	20.00	.....	34.71	.....	31.00	28.21	.....	17.17	.....	11.33

Gate openings, in feet, of Indian Lake reservoir at Indian Lake, N. Y., for 1910.

Date.	Sluice gate A open.	Sluice gate B open.	Date.	Sluice gate A open.	Sluice gate B open.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Jan. 1–24	5.0	5.0	Aug. 16	2.0	.....
Feb. 8–28	5.0	5.0	Aug. 17 to Sept. 27 [a]	5.0	.....
July 1 to July 11	2.5	.....	Oct. 5 to Nov. 1	.....	5.0
Aug. 1 to Aug. 4	5.0	.....	Oct. 18 to Nov. 3	2.5	.....
Aug. 5–6	2.0	.....	Nov. 2–3	.....	2.0
Aug. 9–10	5.0	.....	Dec. 5–10	2.5	.....
Aug. 11	2.0	.....	Dec. 1–31	.....	5.0

[a] Main logway open about 9 feet Aug. 31 to Sept. 20 and open 15 feet Sept. 21 to 30.

This table supersedes the table published in the Sixth Annual Report of the New York State Water Supply Commission and the 1910 report of the New York State engineer and surveyor.

SCHROON RIVER.

GENERAL FEATURES OF AREA DRAINED.

Schroon River rises in Essex County, on the southern slopes of the highest mountains in the Adirondack group, flows in a general southerly direction for about 45 miles through Essex and Warren counties, and joins the Hudson near Thurman. Its total drainage area is 550 square miles. The elevation of its source is about 2,000 feet.

Its basin is largely forested and contains considerable wild land and numerous lakes and ponds. The most important of these is Schroon Lake, through which the river flows, which has a water-surface area of about 6.3 square miles. The river affords excellent opportunities for storage and power development, which are under investigation by the New York State Water Supply Commission. The only power developments are at Warrensburg.

SCHROON LAKE NEAR POTTERSVILLE, N. Y.

This station is located at the outlet of Schroon Lake, 1 mile from Pottersville post office, and is at the steamboat wharf. It was established July 8, 1908, in cooperation with the New York State Water Supply Commission, to obtain information concerning fluctuations in the level of Schroon Lake in connection with the gaging station on Schroon River at Riverbank. A staff gage fastened to the wharf is read once daily. The records are discontinued each year as the lake freezes and reestablished in the spring as soon as the ice breaks up, for which the following dates apply: Discontinued December 5, 1908; reestablished July 1, 1909;[1] discontinued Decem-

[1] No date of ice breaking up in 1909.

ber 4, 1909; reestablished April 17, 1910; and discontinued December 3, 1910. The gage datum was originally placed at elevation 803.75 feet above mean sea level. The gage was raised 0.17 foot by ice action during the winter of 1908–9. The 1909 and 1910 gage heights have been reduced to the original datum by making a plus correction of 0.17 foot.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission of New York.

Daily gage height, in feet, of Schroon Lake near Pottersville, N. Y., for 1910.

[Asel Galusha, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	.....	4.26	5.37	2.87	1.87	2.67	1.97	1.27	1.07
2	.....	.....	.....	.....	4.87	5.47	2.77	1.87	2.57	1.87	1.27	1.07
3	.....	.....	.....	.....	5.07	5.47	2.77	1.97	2.47	1.87	1.37	1.07
4	.....	.....	.....	.....	5.17	5.37	2.77	2.02	2.47	1.77	1.37	.....
5	.....	.....	.....	.....	5.37	5.47	2.67	2.02	2.47	1.77	1.37	.....
6	.....	.....	.....	.....	5.37	5.47	2.67	2.02	2.67	1.67	1.37	.....
7	.....	.....	.....	.....	5.42	5.37	2.57	2.07	2.67	1.57	1.37	.....
8	.....	.....	.....	.....	5.37	5.57	2.27	2.17	2.57	1.47	1.37	.....
9	.....	.....	.....	.....	5.27	5.47	2.27	2.27	2.57	1.47	1.37	.....
10	.....	.....	.....	.....	5.27	5.37	2.07	2.47	2.57	1.47	1.37	.....
11	.....	.....	.....	.....	5.27	5.47	2.07	2.57	2.57	1.47	1.37	.....
12	.....	.....	.....	.....	5.27	5.37	2.07	2.57	2.47	1.37	1.37	.....
13	.....	.....	.....	.....	5.17	5.07	1.97	2.67	2.47	1.37	1.37	.....
14	.....	.....	.....	.....	5.07	5.07	1.97	2.77	2.37	1.37	1.27	.....
15	.....	.....	.....	.....	5.07	4.97	1.97	2.77	2.37	1.37	1.27	.....
16	.....	.....	.....	.....	4.97	4.77	1.97	2.87	2.37	1.37	1.17	.....
17	.....	.....	.....	4.77	4.87	4.77	1.97	2.87	2.37	1.37	1.17	.....
18	.....	.....	.....	4.77	4.87	4.77	1.97	2.87	2.37	1.37	1.17	.....
19	.....	.....	.....	5.12	4.67	4.87	1.97	2.97	2.17	1.27	1.17	.....
20	.....	.....	.....	5.47	4.47	4.87	1.97	3.07	2.07	1.27	1.17	.....
21	.....	.....	.....	5.57	4.47	4.97	1.87	3.07	1.97	1.17	1.17	.....
22	.....	.....	.....	5.57	4.47	5.07	1.87	3.07	1.97	1.17	1.17	.....
23	.....	.....	.....	5.47	4.47	3.17	1.87	3.07	1.77	1.17	1.17	.....
24	.....	.....	.....	5.37	4.57	3.57	1.87	3.07	1.77	1.17	1.07	.....
25	.....	.....	.....	5.47	4.57	3.87	1.87	3.07	1.77	1.17	1.07	.....
26	.....	.....	.....	5.17	4.77	3.67	1.87	3.07	1.87	1.17	1.07	.....
27	.....	.....	.....	5.17	4.87	3.57	1.87	3.07	1.87	1.17	1.07	.....
28	.....	.....	.....	5.17	4.97	3.47	1.87	2.97	1.87	1.07	1.07	.....
29	.....	.....	.....	5.17	5.27	4.07	1.87	2.87	1.97	1.07	1.07	.....
30	.....	.....	.....	5.17	5.27	3.97	1.87	2.77	1.97	1.07	1.07	.....
31	.....	.....	.....	.....	5.47	.....	1.87	2.67	.....	1.17	.....	.....

SCHROON RIVER AT RIVERBANK, N. Y.

This station is located on the steel highway bridge near Riverbank post office, between the towns of Warrensburg and Bolton, about 9 miles north of the village of Warrensburg, and about 10 miles downstream from the outlet of Schroon Lake. It was established September 23, 1907, in cooperation with the New York State Water Supply Commission, to obtain general statistical data in regard to the flow of Schroon River.

There are several dams at the village of Warrensburg which are used for power development. During September, 1907, a timber crib dam for storage was constructed at Starbuckville, about 6 miles above the gaging station. This dam affords a head of about 8 feet and

ponds water to Schroon Lake. Tumble Head Falls begin about 1 mile above the gaging station and extend upstream for about a mile farther, affording a total fall of some 30 feet.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station. During the winter months the discharge is affected by ice. Conditions for obtaining accurate discharge are good, and a very good rating curve has been developed. All discharge measurements are made from the bridge.

Since 1907 the regimen of flow of Schroon River during the low-water season has been somewhat affected by storage in Schroon Lake.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York.

Discharge measurements of Schroon River at Riverbank, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 20[a]	W. G. Hoyt	62	138	1.73	139
Feb. 17[b]	C. C. Covert	72	194	2.63	358
Apr. 1	W. G. Hoyt	85	593	7.22	5,870
2	do	85	600	7.19	5,750
4	do	85	542	6.52	4,840
5	do	85	508	6.21	4,390
June 16	Covert & Phelan	78.6	284	3.54	1,310
Dec. 28[c]	F. J. Shuttleworth	62	166	1.70	186
28[d]	do	102	224	2.00	301

[a] Complete ice cover; gage height to top of ice, 1.83 feet; average thickness of ice, 1 foot.
[b] Complete ice cover; gage height to top of ice, 2.73 feet; average thickness of ice, 1 foot.
[c] Measurement made at bridge under complete ice cover. Gage height to top of ice, 1.70 feet; to bottom, 0.70 foot; average thickness of ice, 0.88 foot.
[d] Measurement made ½ mile below gage under complete ice cover. Gage height to top of ice, 2 feet; to bottom, 0.90 foot; average thickness of ice, 1.30 feet.

Daily gage height, in feet, of Schroon River at Riverbank, N. Y., for 1910.

[J. H. Roberts, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.60	2.45	3.20	7.22	4.25	4.72	2.75	1.35	1.95	2.20	2.15	1.85
2	1.65	2.45	3.45	7.18	4.18	4.55	1.75	1.45	2.00	2.10	2.20	1.90
3	1.60	2.50	3.65	6.88	4.28	4.30	1.65	1.35	2.10	2.20	2.10	1.95
4	1.60	2.50	3.70	6.52	4.20	4.15	1.75	2.00	2.00	2.15	2.15	1.75
5	1.55	2.45	3.70	6.18	4.28	4.05	2.58	1.60	2.00	2.15	2.30	1.80
6	1.60	2.40	3.75	5.90	4.38	4.15	2.35	1.50	2.10	2.15	2.25	1.80
7	1.65	2.45	3.98	5.78	4.45	4.12	2.35	1.45	2.10	2.10	2.30	1.90
8	1.70	2.50	4.22	5.62	4.30	4.35	2.20	1.50	2.15	2.05	2.30	1.85
9	1.75	2.50	4.50	5.45	4.35	4.35	2.20	1.50	2.10	2.00	2.30	1.90
10	1.65	2.50	4.45	5.20	4.30	4.30	2.00	1.45	2.05	2.05	2.30	1.75
11	1.70	2.45	4.52	4.75	4.25	4.15	2.00	1.50	1.95	2.05	2.30	1.70
12	1.70	2.50	4.48	4.30	4.25	4.15	1.65	1.45	2.00	2.10	2.25	1.65
13	1.75	2.60	4.38	4.45	4.20	4.00	1.70	1.40	2.10	2.05	2.15	1.50
14	1.70	2.75	4.22	4.30	4.15	3.72	1.70	1.30	1.55	2.00	2.25	1.55
15	1.70	2.75	4.10	4.20	3.85	3.50	1.60	1.45	1.45	2.00	2.15	1.75
16	1.65	2.60	4.00	4.08	3.85	3.55	1.65	1.50	1.50	1.85	2.10	1.70
17	1.70	2.70	3.90	3.98	3.72	3.50	1.50	1.45	2.00	2.10	2.15	1.65
18	1.70	2.70	3.80	3.72	3.20	3.40	1.55	1.45	1.95	2.10	2.20	1.50
19	2.00	2.75	3.62	3.88	3.20	3.35	1.50	1.45	1.95	2.05	2.20	1.70
20	1.70	2.70	3.58	4.22	3.15	3.25	1.50	1.40	1.90	2.00	1.90	1.70

Daily gage height, in feet, of Schroon River at Riverbank, N. Y., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	1.65	2.65	3.52	4.65	3.22	3.20	1.45	1.40	1.85	1.90	2.10	1.65
22	2.00	2.85	3.52	4.72	3.00	3.15	1.40	1.45	1.90	1.95	2.10	1.60
23	2.05	2.80	3.65	4.62	3.12	3.05	1.55	1.65	1.85	1.85	2.10	1.60
24	2.10	2.75	3.92	4.50	3.45	3.00	1.35	1.70	1.85	1.90	1.85	1.80
25	2.20	2.80	4.50	4.48	3.50	2.90	1.40	1.65	2.05	1.95	2.00	1.70
26	2.30	2.75	5.12	4.40	4.25	2.75	1.35	1.60	2.05	1.95	2.00	1.80
27	2.40	3.00	5.48	4.48	4.18	2.95	1.40	1.50	2.15	1.95	1.80	1.80
28	2.45	3.00	5.88	4.42	4.40	2.95	1.40	1.55	2.40	2.10	1.90	1.70
29	2.40	.....	5.18	4.40	4.30	3.00	1.35	1.65	2.35	2.15	1.80	1.75
30	2.50	.....	6.58	4.35	4.60	2.85	1.30	1.60	2.20	2.00	1.85	1.80
31	2.40	.....	6.95	.....	4.68	.....	1.20	1.80	.....	2.15	.....	1.90

NOTE.—Ice present Jan. 1 to about Mar. 12 and from about Dec. 7 to 31. Gage heights to water surface during these periods. There was also probably more or less backwater from log jams during the latter part of April, all of May, and the first part of June.

Daily discharge, in second-feet, of Schroon River at Riverbank, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	5,460	1,940	2,470	694	136	331	432	411	294
2	.....	.....	.....	5,420	1,870	2,270	259	164	350	390	432	312
3	.....	.....	.....	5,060	1,970	2,000	226	136	390	432	390	331
4	.....	.....	.....	4,620	1,890	1,840	259	350	350	411	411	259
5	.....	.....	.....	4,220	1,970	1,730	608	210	350	411	476	276
6	.....	.....	.....	3,880	2,080	1,840	499	178	390	411	454	276
7	.....	.....	.....	3,740	2,160	1,800	499	164	390	390	476	312
8	.....	.....	.....	3,540	2,000	2,050	432	178	411	370	476	.....
9	.....	.....	.....	3,340	2,050	2,050	432	178	390	350	476	.....
10	.....	.....	.....	3,040	2,000	2,000	350	164	370	370	476	.....
11	.....	.....	.....	2,500	1,940	1,840	350	178	331	370	476	.....
12	.....	.....	.....	2,000	1,940	1,840	226	164	350	390	454	.....
13	.....	.....	2,090	2,160	1,890	1,670	242	149	390	370	411	.....
14	.....	.....	1,910	2,000	1,840	1,400	242	122	194	350	454	.....
15	.....	.....	1,780	1,890	1,520	1,200	210	164	164	350	411	.....
16	.....	.....	1,670	1,760	1,520	1,240	226	178	178	294	390	.....
17	.....	.....	1,570	1,650	1,400	1,200	178	164	350	390	411	.....
18	.....	.....	1,470	1,400	966	1,120	194	164	331	390	432	.....
19	.....	.....	1,310	1,550	966	1,080	178	164	331	370	432	.....
20	.....	.....	1,270	1,910	933	1,000	178	149	312	350	312	.....
21	.....	.....	1,220	2,380	980	966	164	149	294	312	390	.....
22	.....	.....	1,220	2,470	836	933	149	164	312	331	390	.....
23	.....	.....	1,340	2,350	913	868	194	226	294	294	390	.....
24	.....	.....	1,590	2,220	1,160	836	136	242	294	312	294	.....
25	.....	.....	2,220	2,190	1,200	776	149	226	370	331	350	.....
26	.....	.....	2,940	2,100	1,940	694	136	210	370	331	350	.....
27	.....	.....	3,380	2,190	1,870	806	149	178	411	331	276	.....
28	.....	.....	3,870	2,130	2,100	806	149	194	522	390	312	.....
29	.....	.....	3,020	2,100	2,000	836	136	226	499	411	276	.....
30	.....	.....	4,700	2,050	2,330	748	122	210	432	350	294	.....
31	.....	.....	5,140	.....	2,420	.....	97	276	.....	411	.....	.....

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Monthly discharge of Schroon River at Riverbank, N. Y., for 1910.

[Drainage area, 534 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	188	0.352	0.41	D.
February	.....	.....	363	.680	.70	C.
March	5,140	.....	1,910	3.58	4.13	B.
April	5,460	1,400	2,780	5.21	5.81	A.
May	2,420	836	1,700	3.18	3.67	B.
June	2,470	694	1,400	2.62	2.92	A.
July	694	97	260	.487	.56	A.
August	350	122	186	.348	.40	A.
September	522	164	348	.652	.73	A.
October	432	294	368	.689	.79	A.
November	476	276	399	.747	.83	A.
December	331	.....	219	.410	.47	C.
The year	5,460	97	843	1.58	21.42	

NOTE.—Discharge Jan. 1 to Mar. 12 and Dec. 8 to 31 has been computed from a special discharge rating curve based on three discharge measurements made with ice present. Determinations of daily discharge for these periods as published in the Sixth Annual Report of the New York State Water Supply Commission have not been revised in the Federal report. They are not published, however, because they are very approximate. The discharge during each of the three months—January, February, and December—was probably quite uniform.

Mean discharge Mar. 1 to 12 estimated 1,280 second-feet, ranging from 579 to 2,060.

Mean discharge Dec. 8 to 31 estimated 197 second-feet.

Discharge for May probably somewhat too high as a result of backwater from log jams.

SACANDAGA RIVER.

GENERAL FEATURES OF AREA DRAINED.

Sacandaga River is formed by three principal branches which unite in the southeastern part of Hamilton County in the Adirondack region. The West Branch is the outlet of Piseco Lake; the Middle Branch is the outlet of Sacandaga and Pleasant lakes; the East and principal branch issues from a series of small ponds and lakes in the southwestern part of Warren County. The East and Middle branches unite a few miles north of Wells and are joined by the West branch a short distance below Wells. The river then flows southeasterly to about 5 miles below Northville, where it turns and runs northeasterly to the Hudson River at Hadley. Its total drainage area comprises about 1,050 square miles.

Sacandaga Lake, the highest of the tributary lakes in the headwaters, is about 1,700 feet above mean sea level; at its entrance into the Hudson the Sacandaga is at an elevation of about 550 feet. Between Northville and the mouth of the river there is a fall of about 180 feet (chiefly concentrated in the 5 miles below Conklingville) entirely unutilized. There are, in fact, no power developments on the Sacandaga.

The drainage area of this river is largely in forest. Precipitation is high, the mean for the year being about 49 inches, whereas that of the whole Hudson drainage area above Mechanicville is only about 43 inches. Possibilities for storage on the Sacandaga are great, and the State Water Supply Commission of New York proposes a high dam at Conklingville, the reservoir storing about 25,000,000,000 cubic

feet of water, with a water surface of about 40 square miles, and controlling practically the entire flow of the Sacandaga basin. Their plan proposes also to develop the total fall obtained between Conklingville and the Hudson—approximately 200 feet—which will afford 25,000 to 30,000 continuous horsepower.

SACANDAGA RIVER AT WELLS, N. Y.

This station is located on the steel highway bridge over the East Branch of Sacandaga River in the southern part of the village of Wells, about 2½ miles above the junction of the East and West branches. It was established August 25, 1907, in cooperation with the New York State Water Supply Commission, to obtain general statistical and comparative data regarding the flow of this river.

The datum of the chain gage attached to the bridge has been the same during the maintenance of the station.

Discharge measurements are made from the bridge and by wading.

During the winter months the discharge is usually affected by ice.

Conditions for obtaining accurate discharge are good, and a good rating curve has been developed.

Later information has led to the revision of all discharge determinations for this station prior to 1910, and particularly those for stages above a gage height of about 5.5 feet. The revised figures are published in the following tables.

The only discharge measurement affected by this revision was that of November 8, 1907, which is here republished.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York.

Discharge measurements of Sacandaga River at Wells, N. Y., in 1907 and 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1907.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Nov. 8[a]	J. B. Pierson	95	384	7.50	2,670
1910.					
Jan. 9[b]	C. C. Covert	46	95	4.24	68
10[b]	do	46	92	4.26	64
Mar. 26[c]	W. G. Hoyt	100	530	8.5	3,250
27[c]	do	98	438	7.58	2,390
28[c]	do	98	428	7.55	2,420
29[c]	do	97	530	8.5	3,160
Apr. 13[d]	C. C. Covert	90	404	7.26	1,440
14[d]	do	82	258	5.62	503
June 8	W. G. Hoyt	91	351	6.54	1,400
9	do	89	319	6.30	1,170
July 15	J. J. Phelan	55	111	3.90	55
Aug. 21	do	56	129	4.39	148
Oct. 27	W. G. Hoyt	73	172	4.75	248
27	do	82	242	5.39	612
28	do	80	216	5.23	490
Dec. 22[b]	F. J. Shuttleworth	65	124	4.60	112

[a] Measurement made with surface floats near bridge. Revised on the basis of a coefficient of 0.72.
[b] Measurement made under complete ice cover.
[c] Subsurface measurement; a coefficient of 0.72 used to reduce surface velocities to mean in vertical.
[d] Discharge affected by backwater from log jam below bridge.

NOTE.—Some of the discharge measurements for 1910, as published in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York, revised from vertical velocity curve measurements, which indicate that a coefficient of 0.72 should be applied to all measurements made by the subsurface method.

Daily gage height, in feet, of Sacandaga River at Wells, N. Y., for 1910.

[Frank Stanyon, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.12	5.32	8.48	8.92	5.90	6.98	4.35	3.92	3.95	5.30	4.78	4.38
2	4.12	5.65	8.25	8.55	5.85	6.78	4.36	3.90	4.00	5.12	4.74	4.38
3	4.14	5.56	7.65	7.78	6.00	6.58	4.29	3.92	4.15	4.95	4.78	4.38
4	4.15	5.50	7.12	7.52	6.05	6.51	4.22	4.75	4.68	4.84	5.02	4.38
5	4.18	5.35	6.85	7.62	6.00	6.58	4.19	5.20	4.62	4.72	5.50	4.58
6	4.22	5.90	6.70	7.52	6.00	6.90	4.10	4.70	4.70	4.72	5.48	4.90
7	4.24	6.00	6.75	7.40	6.00	7.20	3.90	4.35	4.58	4.65	5.45	4.98
8	4.25	5.85	6.45	7.05	5.90	.....	4.00	4.22	4.45	4.60	5.38	4.78
9	4.25	5.58	6.34	6.45	5.90	6.10	3.96	4.16	4.35	4.62	5.28	4.62
10	4.25	5.42	6.28	6.45	5.72	5.90	3.90	4.15	4.24	4.58	5.22	4.58
11	4.24	5.42	6.18	6.38	5.68	5.92	3.94	5.02	4.16	4.48	5.14	4.50
12	4.26	5.35	6.02	6.30	5.58	6.20	3.90	4.75	4.10	4.40	5.10	4.58
13	4.26	5.28	5.92	6.80	5.52	6.08	3.89	4.45	4.11	4.50	4.88	4.52
14	4.26	5.30	5.80	6.72	5.52	5.72	3.86	4.28	4.28	4.52	4.78	4.58
15	4.26	5.25	5.65	5.95	5.52	5.48	3.84	4.22	4.22	4.48	4.76	4.58
16	4.26	5.26	5.48	6.05	5.62	5.35	3.88	4.92	4.16	4.44	4.72	4.62
17	4.26	5.21	5.49	6.05	5.52	5.48	4.00	4.82	4.10	4.40	4.72	4.68
18	4.36	5.18	5.44	7.50	5.60	5.58	3.99	4.75	4.05	4.35	4.62	4.68
19	5.10	5.15	5.44	8.85	5.75	5.42	3.95	4.62	4.06	4.32	4.55	4.68
20	5.22	5.05	5.42	8.00	5.70	5.18	3.91	4.45	4.04	4.32	4.58	4.66
21	5.22	5.08	5.68	6.12	5.95	4.98	3.88	4.32	4.00	4 32	4.55	4.62
22	7.28	5.35	6.18	6.10	5.80	4.82	3.92	4.28	3.99	4.38	4.52	4.62
23	6.70	5.49	7.22	6.25	5.82	4.78	4.00	4.22	3.96	4.68	4.52	4.62
24	6.20	5.55	8.10	5.15	6.12	4.69	3.97	4.16	3.94	4.55	4.56	4.78
25	6.05	5.50	8.65	5.70	6.58	4.60	3.95	4.18	4.30	4.58	4.50	4.95
26	5.70	5.39	8.70	5.85	7.30	4.50	3.96	4.14	5.05	4.72	4.48	5.12
27	5.35	5.55	7.59	5.72	6.58	4.50	3.96	4.10	7.68	4.84	4.48	5.12
28	5.19	9.48	7.52	5.85	6.12	4.45	4.00	4.05	6.60	5.28	4.42	5.14
29	5.12	.....	8.42	5.90	6.02	4.46	4.11	4.02	6.22	5.22	4.42	5.14
30	5.08	.....	9.05	5.90	6.08	4.38	4.02	4.00	5.92	5.20	4.40	5.75
31	5.18	.....	9.05	.....	6.12	.....	3.95	4.00	.....	4.92	.....	6.78

NOTE.—Ice existed at this station Jan. 1 to about Jan. 20, about Feb. 1 to Feb. 28, and from about Dec. 3 to 31; gage readings to water surface during these periods.
Backwater from log jam affected gage heights Apr. 10 to 25.

Daily discharge, in second-feet, of Sacandaga River at Wells, N. Y., for 1907–1910.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1907.							1907.						
1	.....	.....	25	186	748	380	16	.....	.....	118	450	560	.....
2	.....	.....	25	176	780	358	17	.....	.....	118	425	530	.....
3	.....	.....	33	208	2,350	358	18	.....	.....	100	380	475	.....
4	.....	.....	297	192	1,800	358	19	.....	.....	86	337	450	.....
5	.....	.....	402	450	1,100	337	20	.....	.....	86	337	425	.....
6	.....	.....	260	360	1,460	337	21	.....	.....	83	317	402	.....
7	.....	.....	192	425	2,940	337	22	.....	.....	86	317	530	.....
8	.....	.....	116	337	2,540	317	23	.....	.....	73	297	475	.....
9	.....	.....	105	337	1,890	317	24	.....	.....	118	297	475	.....
10	.....	.....	132	450	1,260	297	25	.....	25	176	260	475	.....
11	.....	.....	225	402	1,030	1,060	26	.....	25	146	225	475	.....
12	.....	.....	780	360	990	1,800	27	.....	25	118	242	475	.....
13	.....	.....	402	650	850	1,060	28	.....	24	105	1,460	450	.....
14	.....	.....	242	530	682	590	29	.....	23	176	1,620	425	.....
15	.....	.....	176	475	620	.....	30	.....	23	167	1,060	425	.....
							31	.....	23	.....	1,290	.....	.....

Daily discharge, in second-feet, of Sacandaga River at Wells, N. Y., for 1907–1910—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.												
1	.....	.....	475	1,540	3,560	715	77	32	16	43	129	188
2	.....	.....	425	1,380	5,210	780	70	26	16	64	121	161
3	.....	.....	425	1,260	2,840	590	64	25	16	68	105	95
4	.....	.....	450	955	2,840	530	60	29	16	68	64	225
5	.....	.....	450	885	3,140	530	64	31	15	45	68	173
6	.....	.....	450	990	2,540	475	60	46	14	39	60	129
7	.....	.....	380	1,380	2,260	402	70	50	16	37	53	225
8	.....	.....	358	2,070	2,350	380	86	45	16	29	48	475
9	.....	.....	358	2,940	2,160	358	73	33	16	27	46	560
10	.....	.....	358	2,540	1,460	358	60	41	14	25	46	530
11	.....	.....	358	3,140	2,840	337	52	36	14	64	70	475
12	.....	.....	380	2,640	1,540	297	46	29	14	53	155	450
13	.....	.....	402	2,160	1,300	260	43	28	13	48	135	402
14	.....	.....	402	2,640	990	242	41	32	12	41	108	380
15	.....	1,890	920	2,350	1,220	225	36	29	12	37	105	358
16	.....	3,560	1,030	1,620	1,220	192	31	28	12	32	105	317
17	.....	2,070	955	1,460	990	176	33	29	12	31	79	278
18	.....	1,460	850	1,260	1,140	192	138	33	12	29	73	225
19	.....	1,340	748	1,980	715	225	167	31	12	26	70	225
20	.....	1,100	682	1,890	715	225	100	31	11	25	86	225
21	.....	955	590	1,710	590	186	75	30	10	24	93	192
22	.....	955	590	1,710	748	161	81	25	10	23	75	186
23	.....	780	560	2,070	650	146	68	29	10	23	77	192
24	.....	682	682	3,560	715	146	57	25	11	25	79	192
25	.....	650	885	4,000	850	146	50	22	11	25	116	186
26	.....	530	850	3,670	486	126	60	21	10	38	192	176
27	.....	530	1,300	3,890	560	100	62	20	11	278	402	180
28	.....	530	2,260	3,560	530	93	57	18	12	161	297	176
29	.....	475	3,350	3,140	530	86	58	17	111	260	161	173
30	.....	.....	2,350	3,040	530	79	46	17	77	225	149	180
31	.....	.....	1,890	.....	685	.....	33	17	.....	161	.....	186
1909.												
1	189	300	1,060	530	1,620	530	110	38	23	37	28	79
2	186	300	885	650	2,440	530	103	32	23	31	28	75
3	176	300	780	885	1,620	475	167	32	22	28	28	64
4	189	300	715	955	2,070	475	144	30	22	26	29	64
5	242	300	583	920	1,620	560	116	29	23	25	31	57
6	1,050	300	650	1,380	2,440	1,060	103	29	23	24	31	64
7	700	1,000	590	3,240	3,780	850	91	28	22	23	27	70
8	500	800	560	3,670	2,540	620	79	27	21	22	24	60
9	500	700	530	3,140	1,380	502	73	26	19	21	21	81
10	400	640	502	2,260	2,540	530	68	26	21	21	22	138
11	440	800	530	1,540	3,350	850	64	25	23	21	27	86
12	310	700	502	1,380	2,350	590	58	24	22	22	29	77
13	280	600	475	2,070	2,160	560	52	23	21	22	29	76
14	300	550	502	5,320	2,160	590	50	23	20	23	29	65
15	360	650	530	4,440	1,980	475	50	27	19	24	29	65
16	390	700	530	3,560	1,620	380	45	41	19	27	29	65
17	340	600	475	3,140	1,300	297	50	118	18	29	36	65
18	300	600	425	3,460	1,100	380	52	127	18	29	41	65
19	260	500	475	3,460	1,180	380	53	105	18	29	43	65
20	230	1,500	450	3,400	1,140	450	50	77	18	29	45	65
21	200	2,800	402	2,080	1,140	380	50	60	18	28	50	65
22	175	2,250	402	2,760	1,030	297	53	53	17	46	50	65
23	175	1,350	402	2,580	815	260	86	50	17	57	81	65
24	250	1,120	380	2,420	620	225	127	41	23	45	108	65
25	1,400	2,400	380	1,620	590	208	135	30	25	38	108	65
26	1,400	1,600	475	1,920	590	186	110	27	25	36	121	65
27	1,000	1,200	450	2,330	590	176	77	26	26	36	155	65
28	700	1,200	475	2,420	650	161	60	24	31	31	118	65
29	600	.....	530	2,500	650	135	53	25	38	33	93	65
30	500	.....	450	2,160	590	116	46	23	41	27	86	65
31	400	.....	475	.....	560	.....	45	23	.....	28	.....	65

NOTE.—Daily discharge for 1907 and 1908 determined from a well-defined discharge rating curve. Tables supersede those published in the New York State and Federal reports.

Daily discharge, in second-feet, of Sacandaga River at Wells, N. Y., for 1907–1910—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	.....	.....	3,240	3,670	920	1,800	146	46	52	530	297	155
2	.....	.....	2,940	3,350	885	1,620	149	43	60	425	278	155
3	.....	.....	2,350	2,540	990	1,460	129	46	93	358	297	.....
4	.....	.....	1,890	2,260	1,030	1,380	110	278	260	317	380	.....
5	.....	.....	1,620	2,350	990	1,460	103	475	225	260	650	.....
6	.....	.....	1,540	2,260	990	1,710	81	260	260	260	650	.....
7	.....	.....	1,620	2,160	990	1,980	43	146	225	242	620	.....
8	.....	.....	1,340	1,800	920	(1,500)	60	111	176	225	590	.....
9	.....	.....	1,260	1,340	920	1,060	53	95	146	225	530	.....
10	.....	.....	1,220	935	780	920	43	93	116	225	475	.....
11	.....	.....	1,140	905	780	920	50	380	95	186	450	.....
12	.....	.....	990	850	715	1,140	43	278	81	161	425	.....
13	.....	.....	920	1,140	650	1,060	42	176	83	192	337	.....
14	.....	.....	850	1,080	650	780	38	127	127	192	297	.....
15	.....	.....	748	670	650	650	36	110	110	186	278	.....
16	.....	.....	650	720	715	560	41	337	95	173	260	.....
17	.....	.....	650	720	650	650	60	297	81	161	260	.....
18	.....	.....	620	1,620	715	715	58	278	70	146	225	.....
19	.....	.....	620	2,670	815	590	52	225	73	138	208	.....
20	.....	.....	590	2,000	780	475	45	176	68	138	225	.....
21	475	.....	780	745	955	380	41	138	60	138	208	.....
22	2,070	.....	1,140	745	850	297	46	127	58	155	192	.....
23	1,540	.....	1,980	822	850	297	60	110	53	260	192	.....
24	1,140	.....	2,840	298	1,060	260	55	95	50	208	208	.....
25	1,050	.....	3,350	545	1,460	225	52	100	132	225	192	.....
26	780	.....	3,460	885	2,070	192	53	91	402	260	186	.....
27	560	.....	2,350	780	1,460	192	53	81	2,440	317	186	.....
28	475	.....	2,260	885	1,060	176	60	70	1,460	530	167	.....
29	425	.....	3,140	920	990	180	83	64	1,140	475	167	.....
30	425	.....	3,780	920	1,060	156	64	60	920	475	161	.....
31	475	.....	3,780	.....	1,060	.....	52	60	.....	337	.....	.....

NOTE.—Daily discharge for 1909 and 1910 determined from a well-defined rating curve. Tables supersede those published in the New York State and Federal reports for 1909, in the Sixth Annual Report of the New York State Water Supply Commission, and in the 1910 report of the New York State engineer and surveyor.

Daily discharge Jan. 6 to Feb. 28 and Dec. 13 to 31, 1909, when ice was present, determined by means of climatologic records and a comparison of discharge of Sacandaga River stations. Discharge Apr. 20 to 29, 1909, corrected for effect of backwater from log jam.

Discharge Apr. 10 to 25, 1910, determined from a special curve obtained from two measurements made during that period, when backwater caused by log jam existed.

Monthly discharge of Sacandaga River at Wells, N. Y., for 1907–1910.

[Drainage area, 263 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1907.						
August 25-31	25	23	24.0	0.091	0.02	B.
September	780	25	172	.654	.73	A.
October	1,620	176	479	1.82	2.10	A.
November	2,940	402	936	3.56	3.97	A.
December	1,800	297	749	2.85	3.29	C.
1908.						
January	.....	.....	450	1.71	1.97	D.
February	3,560	.....	724	2.75	2.97	C.
March	3,350	358	844	3.21	3.70	A.
April	4,000	885	2,250	8.56	9.55	A.
May	5,210	480	1,550	5.89	6.79	A.
June	780	79	292	1.11	1.24	A.
July	167	31	65.1	.248	.29	B.
August	50	17	29.2	.111	.13	B.

Monthly discharge of Sacandaga River at Wells, N. Y., for 1907–1910—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1908.						
September	111	10	18.4	.070	.08	B.
October	278	23	66.9	.254	.29	B.
November	402	46	112	.426	.48	A.
December	560	95	262	.996	1.15	C.
The year	5,210	10	554	2.11	28.64	
1909.						
January	.....	.....	456	1.73	1.99	D.
February	.....	.....	931	3.54	3.69	D.
March	1,060	380	535	2.04	2.35	A.
April	5,320	530	2,410	9.17	10.23	B.
May	3,780	560	1,560	5.93	6.84	A.
June	1,060	116	441	1.68	1.87	A.
July	167	45	78.1	.297	.34	B.
August	127	23	40.9	.156	.18	B.
September	41	17	22.5	.086	.10	B.
October	57	21	29.6	.113	.13	B.
November	155	21	52.5	.200	.22	B.
December	138	57	69.7	.265	.31	D.
The year	5,320	17	546	2.08	28.25	
1910.						
January	2,070	.....	368	1.40	1.61	C.
February	.....	.....	300	1.14	1.19	D.
March	3,780	590	1,800	6.84	7.88	A.
April	3,670	298	1,420	5.40	6.02	A.
May	2,070	650	949	3.61	4.16	A.
June	1,980	156	826	3.14	3.50	A.
July	149	36	64.5	.245	.28	B.
August	475	43	160	.608	.70	A.
September	2,440	50	307	1.17	1.30	A.
October	530	138	262	.996	1.15	A.
November	650	161	320	1.22	1.36	A.
December	.....	.....	120	.456	.53	D.
The year	.....	36	575	2.19	29.68	

NOTE.—Monthly discharge 1907–1910 revised from a new discharge rating curve. These tables supersede those previously published in the New York State and Federal reports for 1907–1909, and in the Sixth Annual Report of the New York State Water Supply Commission, and in the 1910 report of the New York State engineer and surveyor.

Discharge Dec. 15 to 31, 1907, and Jan. 1 to Feb. 14, 1908, estimated from study of general condition of run-off in the upper Hudson River drainage basin. Mean discharge Dec. 15 to 31, 1907, estimated 900 second-feet; mean discharge Feb. 1 to 14, 1908, estimated 250 second-feet.

Discharge for periods in 1910 during which ice existed determined by means of three discharge measurements made with ice present, climatologic records, and comparison of the discharge with that at other stations.

Mean discharge, Jan. 1 to 20, 1910, estimated 100 second-feet, being practically constant at about 65 second-feet Jan. 1 to 17.

Discharge Feb. 1 to 27, 1910, nearly constant; discharge Feb. 28, 1910, probably a few thousand second-feet. Discharge for December, 1910, nearly constant, ranging from about 100 second-feet to nearly 300 second-feet.

SACANDAGA RIVER AT NORTHVILLE, N. Y.

This station, which is located about three-fourths of a mile upstream from the steel highway bridge at Northville, was established August 26, 1907, has been maintained in cooperation with the New York State Water Supply Commission, and was discontinued December 1, 1910. The station is 1 mile below the outlet of East Stony Creek and about 2 miles below West Stony Creek. It is about 1¼ miles above a low storage dam at Sacandaga Park in Northville. Pondage from this dam extends to the highway bridge at certain stages.

A chain gage, attached to a cantilever arm fastened to a tree on the left bank, was read daily. The datum of the gage has remained the same during the maintenance of the station.

Discharge measurements were made during high water from the steel highway bridge in the village of Northville. Medium and low water measurements were made by wading a short distance above the gage.

During the winter months the discharge was usually affected by ice to such an extent that gage readings were discontinued.

Conditions for obtaining the accurate discharge during the remainder of the year were very good and an excellent discharge rating curve has been developed.

The United States Weather Bureau maintains a river and flood station at the steel highway bridge.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York.

Discharge measurements of Sacandaga River at Northville, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 11[a]	C. C. Covert	117	188	2.35	255
Mar. 26	W. G. Hoyt	289	2,350	7.88	13,400
28	do	287	1,730	6.14	7,170
29	do	280	1,900	7.14	9,570
Apr. 2	E. H. Sargent	280	1,910	6.94	9,050
14	W. G. Hoyt	277	968	2.84	1,470
June 7	do	284	1,790	5.90	6,610
8	do	282	1,600	5.26	5,140
July 18	J. J. Phelon	266	784	1.20	247
Aug. 22[b]	do	85.6	144	1.42	279
Oct. 28	W. G. Hoyt	270	914	2.74	1,310

[a] Measurement made about 1,000 feet above gage, under complete ice cover; ice at gage 1.95 feet thick.
[b] Measurement made at wading section.

Daily gage height, in feet, of Sacandaga River at Northville, N. Y., for 1910.

[E. E. Parks, jr., observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1				7.61	4.84	3.62	1.62	1.70	1.54
2				7.34	4.06	3.84	1.54	1.72	1.49
3				6.13	4.18	3.64	1.54	1.74	1.72
4				5.52	5.15	3.74	1.54	1.72	1.74
5				6.02	5.02	3.84	1.44	1.64	1.72
6				5.66	4.32	5.94	1.22	1.42	1.79
7				6.14	3.82	5.25	1.23	1.44	1.74
8				4.94	3.74	4.99	1.49	1.49	1.72
9				4.44	3.42	4.74	1.26	1.64	1.64
10				4.14	3.15	4.12	1.24	1.74	1.54
11				3.89	3.04	4.04	1.22	2.34	1.44
12				3.04	2.89	4.24	1.19	1.92	1.39
13				2.93	2.74	3.74	1.21	1.74	1.34
14				2.83	2.82	3.24	1.16	1.84	1.42
15				2.79	2.82	3.16	1.11	1.71	1.44

Daily gage height, in feet, of Sacandaga River at Northville, N. Y., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
16	.....	.....	.....	2.74	2.75	3.29	1.14	1.69	1.39
17	.....	.....	.....	2.83	2.52	3.42	1.19	1.64	1.54
18	.....	.....	.....	4.89	2.64	3.49	1.17	1.59	1.45
19	.....	.....	.....	6.04	2.76	3.54	1.14	1.69	1.32
20	.....	.....	3.74	5.84	3.02	3.02	1.13	1.64	1.14
21	.....	.....	3.54	4.87	3.54	2.74	1.14	1.62	1.22
22	.....	.....	3.84	3.89	3.49	2.54	1.16	1.54	1.24
23	.....	.....	4.34	3.69	3.44	2.26	1.19	1.34	1.54
24	.....	.....	4.84	4.94	3.14	2.09	1.21	1.34	1.55
25	.....	.....	7.14	5.64	3.24	2.04	1.23	1.34	1.46
26	.....	.....	7.84	4.12	5.69	1.99	1.19	1.40	.....
27	.....	.....	6.29	4.99	5.54	1.94	1.21	1.36	.....
28	.....	.....	6.19	5.61	4.62	1.89	1.72	1.39	.....
29	.....	.....	7.64	4.91	3.64	1.76	1.44	1.34	.....
30	.....	.....	7.94	.....	4.04	1.74	1.26	1.19	.....
31	.....	.....	8.48	.....	3.74	.....	1.22	1.39	.....

NOTE.—Ice present from Jan. 1 to about Mar. 23, and probably during practically all of December. Gage heights recorded Sept. 26 to Nov. 30 are greatly in error and hence are omitted.

Daily discharge, in second-feet, of Sacandaga River at Northville, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	.....	.....	11,200	4,390	2,450	360	400	326
2	.....	.....	.....	10,400	3,090	2,760	326	412	307
3	.....	.....	.....	7,050	3,280	2,480	326	424	412
4	.....	.....	.....	5,710	4,960	2,620	326	412	424
5	.....	.....	.....	6,800	4,720	2,760	291	370	412
6	.....	.....	.....	6,010	3,500	6,620	223	284	454
7	.....	.....	.....	7,080	2,730	5,160	226	291	424
8	.....	.....	.....	4,570	2,620	4,660	307	307	412
9	.....	.....	.....	3,700	2,170	4,210	235	370	370
10	.....	.....	.....	3,210	1,820	3,180	229	424	326
11	.....	.....	.....	2,840	1,670	3,060	223	901	291
12	.....	.....	.....	1,670	1,480	3,370	214	546	275
13	.....	.....	.....	1,530	1,300	2,620	220	424	259
14	.....	.....	.....	1,410	1,390	1,930	205	488	284
15	.....	.....	.....	1,360	1,390	1,830	191	406	291
16	.....	.....	.....	1,300	1,320	2,000	200	395	275
17	.....	.....	.....	1,410	1,070	2,170	214	370	326
18	.....	.....	.....	4,480	1,190	2,270	208	346	294
19	.....	.....	.....	6,840	1,330	2,340	200	395	253
20	.....	.....	.....	6,400	1,650	1,650	197	370	200
21	.....	.....	.....	4,450	2,340	1,300	200	360	223
22	.....	.....	.....	2,840	2,270	1,090	205	326	229
23	.....	.....	.....	2,550	2,200	829	214	259	326
24	.....	.....	4,390	4,570	1,800	684	220	259	330
25	.....	.....	9,750	5,960	1,930	643	226	259	297
26	.....	.....	11,900	3,180	6,070	602	214	278	.....
27	.....	.....	7,440	4,660	5,750	562	220	266	.....
28	.....	.....	7,200	5,900	4,000	523	412	275	.....
29	.....	.....	11,300	4,520	2,480	436	291	259	.....
30	.....	.....	12,300	4,460	3,060	424	235	214	.....
31	.....	.....	14,100	.....	2,620	.....	223	275	.....

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Daily discharge for Mar. 20-23 and Sept. 26 to Nov. 30, published in the Sixth Annual Report of the New York State Water Supply Commission and the 1910 report of the State engineer and surveyor, is greatly in error and has been revised. It is not published in the Federal report because only very approximate.

Monthly discharge of Sacandaga River at Northville, N. Y., for 1910.

[Drainage area, 740 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	900	1.22	1.41	D.
February	.....	.....	750	1.01	1.05	D.
March	14,100	.....	5,300	7.16	8.26	B.
April	11,200	1,300	4,600	6.22	6.94	A.
May	6,070	1,070	2,630	3.55	4.09	A.
June	6,620	424	2,240	3.03	3.38	A.
July	412	191	245	.331	.38	A.
August	901	214	367	.496	.57	A.
September	.....	200	520	.703	.78	B.
October	.....	.....	600	.811	.94	B.
November	.....	.....	850	1.15	1.28	B.
December	.....	.....	350	.473	.54	D.
The year	14,100	191	1,620	2.19	29.62	

NOTE.—Monthly discharge for periods for which no daily discharge is published determined by a close interpolation between run-off per square mile at Wells and at Hadley.

Mean discharge Mar. 1 to 23 estimated 3,740 second-feet.

Mean discharge Sept. 26–30 estimated 1,520 second-feet.

Discharge for March and September to November revised, superseding that published in the Sixth Annual Report of the New York State Water Supply Commission and the 1910 report of the State engineer and surveyor.

SACANDAGA RIVER NEAR HADLEY, N. Y.

UPPER BRIDGE STATION.

This station, which was originally located at the steel highway bridge about 2½ miles west of Hadley, was established September 13, 1907, in cooperation with the New York State Water Supply Commission, and was discontinued December 31, 1910, on account of the almost continual backwater caused by log jams.

The nearest dam, which is partly washed away, is located at Conklingville, about 3½ miles upstream from the highway bridge.

The datum of the chain gage attached to the bridge remained the same during the maintenance of the station.

Discharge measurements were made from the bridge.

The relation of gage height to discharge was considerably affected by ice during the winter months, and by backwater from frequent log jams.

Conditions for obtaining accurate discharge records at this station are fair, except during the existence of log jams or ice The open water discharge rating curve is fairly well developed for high stages but not well developed for low stages.

CABLE STATION.

On November 12, 1910, a new station was established at a point about 1 mile above the mouth of Sacandaga River, in order to avoid inaccuracies in the records caused by backwater due to log jams

which occurred at the upper bridge station. At this new location no backwater from log jams is known, but the channel was exceedingly rough. In order to improve the measuring section at the cable station, the channel was cleared of bowlders and irregularities as far as was feasible, so that fairly accurate discharge measurements can now be made at medium and high stages from a cable located about 30 feet above the gage. At low stages measurements are made about three-fourths of a mile above the cable where there is a smooth section with a gravel bottom; measurements at this point are made from a boat or by wading.

About 30 feet downstream from the cable and on the left bank a concrete well was built, 3 feet square, inside dimensions, in which a Barrett and Lawrence self-recording gage has been installed. The bottom of the well is about 2 feet below low water and 12 feet below ground surface; it is connected with the river by a 4-inch cast-iron water pipe, 48 feet long, its intake pointing downstream and protected by a fine wire screen. Inside the well and securely bolted to the side is a bed plank to which is fastened a staff gage (used for reference), the zero of which is at elevation 573.36 feet, referred to a United States Geological Survey aluminum tablet set in the foundation wall of the Union Bag & Paper Co.'s mill at Hadley. On top of the well is a concrete shelter 6 feet high and 3 feet square, inside dimensions, for protecting the recording gage.

During the winter the water in the well and in the intake pipe never freezes because the water level in each is below the frost line.

Owing to defective gage, the record for November and December was not recorded.

LOWER BRIDGE STATION.

On September 24, 1909, a station was established at the steel highway bridge near the mill of the Union Bag & Paper Co., at Hadley, to assist in interpreting the records at the upper bridge station when affected by backwater from ice and log jams.

No important tributaries enter the Sacandaga between the upper and lower bridge stations, and hence the determinations of daily and monthly discharge at the two stations should compare favorably under conditions of free flow. The lower station, however, is at times affected by backwater from the Hudson, when high or medium stages occur on that river. The Hudson passes the mouth of the Sacandaga about 1,000 feet below the station. Low stages in the Hudson undoubtedly cause no backwater in the Sacandaga at the lower bridge station, owing to a slight fall immediately below the lower bridge; during medium stages of the Sacandaga also there is usually sufficient pitch to practically eliminate the effect of backwater from the Hudson.

A chain gage is attached to the bridge from which the discharge measurements are made. The gage is read twice daily and the records are furnished by the Union Bag & Paper Co.

The measurements at the upper bridge station and at the cable station, in connection with the observer's gage heights at the lower bridge station, have been used in the development of the discharge rating curve for the lower bridge station.

Concerning the tables of daily discharge for the three stations at Hadley, the somewhat broad assumption may be made that when the upper bridge station apparently shows an appreciably greater discharge than the lower bridge station, the former is affected by backwater from ice or log jams; and, similarly, when the lower bridge station apparently shows an appreciably greater discharge than the upper bridge station, the lower bridge station is affected by ice, log jams, or backwater from the Hudson. At times backwater exists at both stations, and at the lower station backwater is also frequently caused by jams formed by logs floating from the Hudson and logs from the Sacandaga lodging at its mouth.

Daily discharge at the lower bridge station is not given for many periods when it was apparent that it was much in excess of the discharge at the upper bridge station, as determined by comparison with the discharge at the latter point and a study of the gage heights at Corinth on the Hudson, the latter indicating probable backwater from the Hudson.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York.

Discharge measurements of Sacandaga River at upper bridge near Hadley, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 21[a]	W. G. Hoyt	207	1,340	3.92	716
Mar. 5	C. C. Covert	282	1,250	5.65	11,200
6	do	274	1,190	5.50	9,740
31	W. G. Hoyt	286	1,420	6.15	14,500
Apr. 5	do	285	1,020	4.68	7,840
Oct. 2	J. J. Phelan	254	383	2.62	1,320
Dec. 30[b]	F. J. Shuttleworth	214	414	4.12	741

[a] Measurement made through ice about 1 mile below upper bridge gage; average thickness of ice, 1.40 feet.
[b] Measurement made under partial ice cover.

Daily gage height, in feet, of Sacandaga River at upper bridge near Hadley, N. Y., for 1910.

[W. W. Jeffers, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.48	5.15	14.30	6.45	4.05	3.72	1.92	1.50	1.30	2.85	2.28	1.95
2	3.55	5.25	14.30	6.50	3.98	3.58	1.82	1.55	1.42	2.65	2.22	1.90
3	3.55	5.45	14.50	6.25	3.80	3.50	1.80	1.58	1.48	2.45	2.12	1.88
4	3.55	5.55	13.10	5.60	3.82	3.38	1.75	1.60	1.50	2.25	2.35	1.85
5	3.60	5.35	5.75	4.90	3.90	3.35	1.70	1.95	1.62	2.15	2.70	1.80
6	3.60	5.15	5.45	4.55	3.98	3.95	1.62	2.15	1.75	1.98	2.95	1.75
7	3.55	7.30	5.10	4.45	3.85	4.65	1.60	2.30	1.95	1.92	3.08	1.80
8	3.50	7.40	4.85	4.30	3.82	4.58	1.55	2.05	2.00	1.90	3.00	1.85
9	3.50	7.60	4.70	4.20	3.72	4.60	1.50	1.88	1.88	1.85	2.88	1.82
10	3.45	7.75	4.65	4.15	3.55	4.40	1.50	1.80	1.78	1.82	2.80	1.80

Daily gage height, in feet, of Sacandaga River at upper bridge near Hadley, N. Y., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	3.40	7.85	4.55	3.75	3.32	4.42	1.50	1.75	1.75	1.80	2.68	1.90
12	3.30	8.00	4.40	3.55	3.28	4.35	1.45	2.05	1.70	1.78	2.60	2.05
13	3.18	8.00	4.25	3.48	3.05	4.40	1.45	1.95	1.62	1.75	2.55	2.50
14	3.85	.....	4.20	3.40	3.02	4.30	1.40	1.75	1.68	1.78	2.50	2.60
15	2.55	.....	4.10	3.25	2.92	4.10	1.40	1.70	1.82	1.75	2.48	2.75
16	2.50	.....	4.00	3.05	2.90	3.75	1.40	1.68	1.78	1.70	2.42	2.95
17	2.50	.....	3.90	2.95	2.80	3.52	1.42	1.62	1.72	1.65	2.38	3.12
18	2.55	.....	3.75	3.60	2.85	3.22	1.50	1.65	1.68	1.65	2.28	3.22
19	2.90	.....	3.55	4.20	2.70	3.55	1.48	1.70	1.62	1.60	2.20	3.28
20	3.38	7.20	3.25	4.42	2.78	3.52	1.40	1.75	1.58	1.60	2.15	3.32
21	3.80	7.20	3.05	4.50	2.95	3.38	1.40	1.70	1.52	1.55	2.10	3.40
22	4.45	7.28	3.40	4.35	3.05	3.15	1.42	1.60	1.50	1.58	2.08	3.45
23	8.00	7.32	3.75	4.15	3.32	2.92	1.42	1.58	1.45	1.70	2.02	3.50
24	8.35	7.38	4.15	3.95	3.35	2.75	1.40	1.52	1.40	1.78	1.98	3.55
25	7.85	7.35	4.50	3.88	3.52	2.48	1.40	1.50	1.50	1.88	1.90	3.58
26	7.45	7.25	4.85	3.92	4.15	2.25	1.40	1.45	1.58	1.92	1.98	3.60
27	6.80	7.15	5.35	4.10	4.50	2.18	1.45	1.40	1.75	1.98	2.00	3.65
28	6.20	7.60	5.55	4.35	4.28	2.12	1.50	1.40	2.85	2.05	2.05	3.70
29	5.90	.....	5.75	4.35	4.32	2.05	1.55	1.40	3.20	2.40	2.02	3.75
30	5.50	.....	5.95	4.12	4.05	2.00	1.60	1.35	3.10	2.50	2.00	3.78
31	5.15	.....	6.15	.....	3.85	.....	1.52	1.32	.....	2.38	.....	3.80

NOTE.—Relation between gage height and discharge affected by backwater from ice and log jams from Jan. 1 to Mar. 4 and from about Dec. 7 to 31. During these periods the gage readings were taken to the water surface.

Daily discharge, in second-feet, of Sacandaga River at upper bridge near Hadley, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,540	8,350	15,000	4,930	3,930	606	340	250	1,830	966	630
2	.....	1,250	13,300	15,200	4,710	3,340	534	370	300	1,490	894	590
3	.....	1,250	15,800	14,000	4,160	3,320	520	388	330	1,190	782	576
4	.....	1,160	12,500	11,100	4,220	3,010	490	400	340	930	1,060	555
5	.....	1,080	11,700	8,050	4,460	2,940	460	630	412	815	1,570	520
6	.....	960	10,400	6,660	4,710	4,620	412	815	490	654	2,020	490
7	.....	750	8,890	6,290	4,310	7,040	400	990	630	606	2,300	.....
8	.....	750	7,840	5,760	4,220	6,770	370	715	670	590	2,120	.....
9	.....	725	7,240	5,420	3,930	6,850	340	576	576	555	1,880	.....
10	.....	805	7,040	5,260	3,460	6,110	340	520	508	534	1,740	.....
11	.....	700	6,660	4,020	2,860	6,180	340	490	490	520	1,540	.....
12	.....	605	6,110	3,460	2,760	5,940	315	715	460	508	1,410	.....
13	.....	640	5,590	3,270	2,230	6,110	315	630	412	490	1,340	.....
14	.....	685	5,420	3,060	2,160	5,760	290	490	448	508	1,260	.....
15	.....	628	5,090	2,690	1,960	5,090	290	460	534	490	1,230	.....
16	.....	628	4,770	2,230	1,920	4,020	290	448	508	460	1,150	.....
17	.....	628	4,460	2,020	1,740	3,370	300	412	472	430	1,090	.....
18	.....	560	4,060	3,590	1,830	3,620	340	430	448	430	966	.....
19	.....	560	3,500	5,420	1,570	3,460	330	460	412	400	870	.....
20	.....	599	2,690	6,180	1,710	3,370	290	490	388	400	815	.....
21	716	628	2,230	6,470	2,020	3,010	290	460	352	370	760	.....
22	3,000	805	3,060	5,940	2,230	2,460	300	400	340	388	742	.....
23	6,000	930	4,060	5,260	2,860	1,960	300	388	315	460	688	.....
24	4,020	1,440	5,260	4,620	2,940	1,660	290	352	290	508	654	.....
25	3,200	1,340	6,470	4,400	3,370	1,230	290	340	340	576	590	.....
26	2,500	1,340	7,840	4,520	5,260	930	290	315	388	606	654	.....
27	2,000	1,500	9,960	5,090	6,470	848	315	290	490	654	670	.....
28	1,800	3,310	10,800	5,940	5,690	782	340	290	1,830	715	715	.....
29	1,700	.....	11,700	5,940	5,830	715	370	290	2,570	1,120	688	.....
30	1,600	.....	12,700	5,160	4,930	670	400	270	2,340	1,260	670	.....
31	1,500	.....	13,600	.....	4,310	.....	352	258	.....	1,090	.....	.....

NOTE.—Daily discharge determined from a discharge rating curve not very well defined.

Daily discharge Jan. 1 to Mar. 4 as published in the Sixth Annual Report of the New York State Water Supply Commission and the 1910 report of the New York State engineer and surveyor, revised. Daily discharge Jan. 1–20 and Dec. 7–31 not published in Federal report on account of too great an error.

Discharge Feb. 1 to Mar. 3 determined from record of lower bridge station, where there was probably only slight backwater from ice. Discharge Jan. 22 to 31 and Mar. 4 estimated.

Monthly discharge of Sacandaga River at upper bridge near Hadley, N. Y., for 1910.

[Drainage area, 1,050 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	6,000	.....	1,120	1.07	1.23	C.
February	3,310	560	1,020	.971	1.01	C.
March	15,800	2,230	7,710	7.34	8.46	B.
April	15,200	2,020	6,070	5.78	6.45	B.
May	6,470	1,570	3,540	3.37	3.88	B.
June	7,040	670	3,640	3.47	3.87	B.
July	606	290	358	.341	.39	B.
August	990	258	465	.443	.51	B.
September	2,570	250	611	.582	.65	C.
October	1,830	370	696	.663	.76	A.
November	2,300	590	1,130	1.08	1.20	C.
December	.....	.....	543	.517	.60	D.
The year	15,800	250	2,240	2.14	29.01	

NOTE.—Discharge for periods during which ice existed have been estimated by means of five discharge measurements made with ice present, climatologic records, and comparison with records of discharge at other stations.

Mean discharge Jan. 1-20, estimated above 330 second-feet, nearly constant.

The table is a revision of and supersedes that published in the Sixth Annual Report of the New York State Water Supply Commission and the 1910 report of the State engineer and surveyor.

Discharge measurements of Sacandaga River at cable station near Hadley, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 28	J. J. Phelan	215	453	3.80	948
30	.....do	215	499	4.10	1,190
31	.....do	215	457	3.90	1,030
Nov. 2	.....do	213	446	3.70	806
12	F. J. Shuttleworth	218	592	4.12	1,440
Dec. 1	J. J. Phelan	210	399	3.43	632

Discharge measurements of Sacandaga River at lower bridge at Hadley, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 17 [a]	C. C. Covert	98	563	5.66	765
Mar. 1	.....do	130	1,100	9.85	7,290
1	.....do	130	1,230	9.9	8,490
Apr. 5	W. G. Hoyt	131	.....	10.7	10,200
June 18	C. C. Covert	126	841	7.88	3,040
July 20	.....do	97	443	4.50	328
22	J. J. Phelan	103	478	4.48	325
Aug. 6	.....do	108	564	5.87	850
10	.....do	91	428	4.65	350
Sept. 21	.....do	91	422	4.50	252
23	.....do	90.5	428	4.46	315
Oct. 1	.....do	121	718	6.9	1,920
1	.....do	121	687	6.73	1,820
2	.....do	120	650	6.4	1,450
2	.....do	118	633	6.3	1,390
3	.....do	116	604	6.01	1,030
4	.....do	116	594	5.8	948
5	.....do	114	576	5.6	803
6	.....do	113	556	5.49	720
7	.....do	111	540	5.34	644
8	.....do	101	527	5.23	626
9	.....do	104	520	5.20	643
10	.....do	101	491	5.12	602
12	.....do	101	491	5.11	564
12	.....do	101	480	5.02	593
14	.....do	101	482	5.00	536
17	.....do	92	470	4.92	521
18	.....do	91.6	460	4.90	494
19	.....do	91.6	455	4.84	452
27	.....do	104	518	5.45	717

[a] Only a small amount of shore ice.

Daily gage height, in feet, of Sacandaga River at lower bridge at Hadley, N. Y., for 1910.

[M. J. Smith, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	6.45	9.95	13.75	.....	8.85	4.65	4.38	4.28	6.90	5.80	5.22
2	.....	6.20	11.50	13.95	8.70	8.55	4.55	4.32	4.30	6.10	5.60	5.20
3	.....	6.20	12.15	12.50	8.35	8.15	.....	4.32	4.35	5.70	5.52	5.05
4	.....	6.10	12.20	11.60	8.40	.....	.....	4.42	.....	5.52	5.72	.....
5	.....	5.95	15.90	11.40	8.85	.....	4.70	4.90	.....	5.42	6.18	4.92
6	.....	.....	.....	10.70	8.85	8.45	4.55	5.80	5.08	5.30	.....	4.85
7	.....	5.50	11.25	10.45	8.60	9.45	4.35	.....	5.30	5.30	7.10	5.02
8	.....	5.50	10.80	10.30	.....	9.95	4.25	4.70	5.38	5.22	6.85	5.35
9	.....	5.45	10.50	10.05	8.00	9.95	4.40	4.72	5.25	.....	6.58	5.65
10	.....	5.65	10.50	.....	7.60	9.55	.....	4.62	5.15	5.10	6.32	6.32
11	.....	5.40	10.20	9.00	7.40	9.25	4.35	4.72	4.82	5.12	6.22	.....
12	.....	5.20	9.45	8.55	7.20	.....	4.30	5.30	4.82	5.02	6.22	6.80
13	.....	.....	9.10	8.10	7.00	9.00	4.25	4.90	4.75	4.98	.....	7.48
14	.....	5.35	8.85	7.60	6.80	8.85	4.30	.....	5.15	4.92	5.98	7.00
15	.....	5.25	8.85	7.45	.....	8.35	4.30	4.82	5.08	4.90	5.98	6.90
16	.....	5.25	8.50	7.00	6.75	8.05	4.20	4.70	4.98	.....	5.85	7.45
17	.....	5.25	8.05	.....	6.55	7.85	.....	4.60	4.78	4.88	5.78	7.42
18	.....	5.10	7.50	7.05	6.40	7.70	4.30	4.75	4.70	4.80	5.50	.....
19	.....	5.10	7.75	8.90	6.85	.....	4.30	4.80	4.62	4.75	5.35	7.00
20	.....	.....	.....	9.60	7.00	7.75	4.05	4.80	4.52	4.70	.....	6.85
21	.....	5.25	7.75	9.40	6.90	7.30	4.05	.....	4.52	4.70	5.20	6.65
22	.....	5.60	8.25	9.45	.....	6.90	4.18	4.75	4.50	4.68	5.22	6.58
23	.....	5.85	8.60	9.10	7.40	6.55	4.25	4.62	4.48	.....	5.32	.....
24	8.25	6.40	9.05	.....	7.30	6.25	.....	4.55	4.45	5.12	5.30	.....
25	8.20	6.30	9.85	8.25	8.15	5.85	4.42	4.50	.....	5.02	5.30	.....
26	8.10	6.25	11.00	8.60	9.30	.....	4.38	4.55	5.00	5.22	5.25	.....
27	7.70	.....	12.00	9.45	10.05	5.55	4.40	4.40	6.20	5.32	.....	.....
28	7.45	7.80	12.00	9.70	9.80	5.35	4.42	.....	6.92	5.72	5.22	.....
29	7.15	.....	11.85	9.40	.....	5.15	4.55	4.35	8.15	6.30	5.20	.....
30	6.95	.....	12.20	9.25	8.90	4.95	4.60	4.32	7.55	.....	5.30	.....
31	6.65	.....	13.05	.....	8.75	.....	4.50	4.30	.....	6.02	.....	.....

NOTE.—Backwater from ice about Jan. 25 to 31, and about Dec. 7 to 31. Also slight backwater during the first few and last few days of February.

Daily discharge, in second-feet, of Sacandaga River at lower bridge at Hadley, N. Y., for 1909 and 1910.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1909.					1909.				
1	.....	350	325	605	16	.....	255	325	.....
2	.....	300	325	560	17	.....	265	325	.....
3	.....	312	350	628	18	.....	275	338	.....
4	.....	312	325	605	19	.....	300	395	.....
5	.....	288	325	520	20	.....	325	350	.....
6	.....	275	325	480	21	.....	325	325	.....
7	.....	255	325	445	22	.....	350	350	.....
8	.....	245	325	445	23	.....	380	350	.....
9	.....	245	300	445	24	235	445	410	.....
10	.....	255	325	.....	25	235	445	540	.....
11	.....	245	325	.....	26	235	445	605	.....
12	.....	235	325	.....	27	245	445	650	.....
13	.....	215	325	.....	28	255	410	582	.....
14	.....	217	325	.....	29	350	410	605	.....
15	.....	245	325	.....	30	325	350	700	.....
					31	.....	350	.....	.....

Daily discharge, in second-feet, of Sacandaga River at lower bridge at Hadley, N. Y., for 1909 and 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	.....	1,540	8,350	.....	.....	.....	395	325	300	2,000	930	605
2	.....	1,250	13,300	.....	.....	.....	365	300	300	1,160	805	605
3	.....	1,250	15,800	.....	.....	.....	380	300	313	865	750	540
4	.....	1,160	.....	.....	.....	.....	395	325	390	750	865	510
5	.....	1,080	.....	.....	.....	.....	410	480	470	700	1,250	480
6	.....	960	.....	.....	.....	.....	365	930	560	650	1,760	462
7	.....	750	.....	.....	.....	.....	313	670	650	650	2,260	.....
8	.....	750	.....	.....	.....	.....	288	410	700	605	1,880	.....
9	.....	725	.....	.....	3,650	.....	325	410	628	582	1,650	.....
10	.....	805	.....	.....	2,990	.....	319	380	580	560	1,340	.....
11	.....	700	.....	.....	2,690	6,100	313	410	445	560	1,250	.....
12	.....	665	.....	.....	2,400	5,900	300	650	445	520	1,250	.....
13	.....	640	.....	.....	2,130	5,700	288	480	428	520	1,170	.....
14	.....	685	5,250	2,990	1,880	5,250	300	462	582	480	1,080	.....
15	.....	628	5,250	2,690	1,880	4,410	300	445	560	480	1,080	.....
16	.....	628	4,610	2,130	1,880	4,020	275	410	520	480	930	.....
17	.....	628	3,650	2,130	1,650	3,310	288	380	445	480	930	.....
18	.....	560	2,840	2,130	1,440	3,150	300	428	410	445	750	.....
19	.....	560	3,310	5,470	1,880	3,230	300	445	380	428	675	.....
20	.....	599	.....	.....	2,130	3,310	245	445	350	410	640	.....
21	.....	628	.....	.....	2,000	2,540	245	436	350	410	605	.....
22	.....	805	.....	.....	2,390	2,000	275	428	350	410	605	.....
23	.....	930	.....	.....	2,690	1,650	288	380	350	485	650	.....
24	4,020	1,440	.....	.....	2,540	1,340	306	365	338	560	650	.....
25	3,200	1,340	.....	4,210	4,020	930	325	350	430	520	650	.....
26	2,500	1,340	.....	.....	.....	860	325	365	520	605	628	.....
27	2,000	1,500	.....	.....	.....	805	325	325	1,250	650	616	.....
28	1,800	3,310	.....	.....	.....	675	325	319	2,000	865	605	.....
29	1,700	.....	.....	.....	.....	582	365	313	4,020	1,340	605	.....
30	1,600	.....	.....	.....	.....	500	380	300	2,990	1,210	650	.....
31	1,500	.....	.....	.....	.....	.....	350	300	.....	1,080	.....	.....

NOTE.—Daily discharge for 1909 to 1910 determined from a discharge rating curve not very well defined. As the records are only approximate, the gage heights have been reduced to the nearest tenth and half tenth foot before applying the discharge rating table. Discharge for days omitted from the record during periods Sept. 24 to Dec. 31, 1909, and Jan. 24 to Dec. 22, 1910, was affected by backwater from ice, log jams, or high stages in the Hudson. Discharge Jan. 25 to 31, 1910, estimated; no correction made to February, 1910, discharge for possible backwater from ice.

Monthly discharge of Sacandaga River at lower bridge at Hadley, N. Y., for 1909 and 1910.

[Drainage area, 1,060 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1909.						
October	445	215	315	0.297	0.34	B.
November	700	300	391	.369	.41	B.
1910.						
February	3,310	560	1,020	.962	1.00	C.
July	410	245	322	.304	.35	B.
August	930	300	418	.394	.45	B.
September	4,020	300	735	.693	.77	C.
October	2,000	410	692	.653	.75	A.
November	2,200	605	984	.928	1.04	C.

WEST BRANCH OF SACANDAGA RIVER AT WHITEHOUSE, N. Y.

The West Branch of the Sacandaga is formed by the union of Piseco Lake outlet with a small stream formed in Silver Lake Mountain. It drains a forested area about 188 square miles in extent above Whitehouse, and discharges into the main river about 7 miles east of Whitehouse and about 1 mile south of Wells.

A gaging station was established at Whitehouse August 20, 1910, in cooperation with the New York State Water Supply Commission.

Not enough measurements have been made to determine a rating for this station.

On account of unsatisfactory conditions this station was abandoned March 14, 1911, in favor of a new station at Blackbridge.

Discharge measurements of West Branch of Sacandaga River at Whitehouse, N. Y., in 1910.[a]

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 16	J. J. Phelan	126	132	3.32	76.4
Aug. 20	do	124	156	3.50	125

[a] Made at the wading section.

Daily gage height, in feet, of West Branch of Sacandaga River at Whitehouse, N. Y., for 1910.

[John Seaver, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.30	3.95		3.4	16		3.30	3.4	3.9	3.9
2		3.30	3.8		3.4	17		3.30	3.4	3.85	3.95
3		3.30	3.7		3.35	18		3.30	3.4	3.8	4.0
4		3.38	3.68		3.4	19		3.30	3.4	3.75	4.0
5		3.30	3.7	4.1	3.4	20	3.50	3.30	3.4	3.8	4.0
6		3.70	3.7	4.2	3.4	21	3.50	3.30	3.4	3.8	4.0
7		3.65	3.7	4.1	3.3	22	3.42	3.30	3.4	3.8	4.0
8		3.65	3.7	4.02	3.3	23	3.40	3.30	3.45	3.7	4.0
9		3.70	3.6	3.98	3.4	24	3.40	3.40		3.5	4.3
10		3.65	3.55	4.0	3.5	25	3.40	3.55		3.5	4.3
11		3.45	3.5	4.0	3.8	26	3.42	4.00		3.4	4.3
12		3.40	3.4	4.0	3.8	27	3.38	4.05		3.4	4.3
13		3.40	3.4	4.0	3.8	28	3.38	4.30		3.7	4.32
14		3.40	3.4	3.98	3.85	29	3.34	4.15			4.4
15		3.40	3.4	3.9	3.85	30	3.33	4.00		3.4	5.0
						31	3.33				5.0

NOTE.—Ice conditions probably prevailed at this station from about Dec. 9 to 31.

HOOSIC RIVER.

GENERAL FEATURES OF AREA DRAINED.

Hoosic River rises on the west slope of the Hoosac Mountains in Vermont and Massachusetts. Two head branches, one flowing southward and the other northward along the west slope of this range, unite at North Adams, Mass., and the stream then flows northwestward, entering the Hudson 3 miles north of Mechanicville. Above Buskirk the drainage basin is rugged and precipitous, the distribution of tributaries affording rapid concentration of the run-off from the

steep rock slopes. The ridges are sparsely wooded. The soil in the valleys is generally firm and tenacious. The general elevation of the valley at the junction of the headwaters is 1,000 feet. Numerous dams, affording power for textile, agricultural implement, and other industries, are scattered throughout the length of the stream from North Adams to Schaghticoke. The drainage basin contains no important lakes and but one storage reservoir, at Farnam, near the head of the South Branch.

South of Hoosic River the State boundary follows the Taconic Ridge, which forms the divide between the Hoosic in Massachusetts and the Little Hoosic in New York.

HOOSIC RIVER NEAR EAGLE BRIDGE, N. Y.

This station, which is located about 1½ miles upstream from Eagle Bridge and half a mile below the mouth of Walloomsac River, was established August 13, 1910, to replace the gaging station at Buskirk.

The gage is of the chain and weight type and is supported by a cantilever arm 14 feet long fastened to two trees a short distance back from the edge of the left bank and about 12 feet above low water.

The left bank is high; the right bank is low and subject to overflow at high stages. About 1,000 feet downstream from the gage the banks are high on both sides and flooded only during periods of extreme high water, which is usually caused by temporary ice jams at the railroad bridge about three-fourths mile downstream.

Discharge measurements during 1910 were made by wading a short distance below the gage. High-water measurements can be made from the highway bridge at Eagle Bridge.

The operation of the dam of Walter A. Wood & Co. at Hoosick Falls, about 2 miles upstream from the gage, has considerable influence on the flow of the stream during low water. Walloomsac River, also slightly controlled by power plants, enters Hoosic River about 1½ miles below the dam at Hoosick Falls.

The relation between gage height and discharge during the winter is affected by ice.

Information in regard to this station is contained in the report of the State engineer and surveyor, State of New York.

Discharge measurements of Hoosic River near Eagle Bridge, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 2	J. J. Phelan	112	224	[a] 7.25	263
10	C. C. Covert	118	131	7.03	162
Dec. 20[b]	W. G. Hoyt	115	254	8.24	299

[a] Measurement made before new gage was installed. The location of the reference point by means of which the gage height was determined is questionable.
[b] Measurement made under complete ice cover.

Daily gage height, in feet, of Hoosic River near Eagle Bridge, N. Y., for 1910.

[Mrs. Vashti Russell, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	6.9	7.05	6.9	7.5	16	7.0	7.2	6.85	7.75	8.5
2	.....	6.88	6.75	6.88	7.32	17	7.0	7.2	6.95	7.68	8.5
3	.....	6.95	6.95	7.3	7.45	18	7.05	6.98	6.95	7.55	8.2
4	.....	6.95	7.0	8.65	7.25	19	7.15	7.05	6.9	7.58	8.1
5	.....	6.95	6.95	8.5	7.4	20	6.85	7.15	6.95	7.5	8.3
6	.....	7.4	7.05	8.28	7.4	21	6.7	7.08	6.85	7.52	8.3
7	.....	9.15	7.02	7.95	7.4	22	7.0	6.92	6.75	7.45	8.1
8	.....	7.95	6.98	7.7	7.45	23	6.95	6.85	6.98	7.65	8.0
9	.....	7.5	6.9	7.62	7.45	24	6.85	6.8	6.95	7.28	8.85
10	.....	7.38	7.2	7.7	7.45	25	7.05	6.75	7.0	7.45	10.88
11	.....	7.2	7.05	7.95	7.45	26	6.85	7.0	7.1	7.5	9.55
12	.....	7.3	6.95	7.45	7.5	27	6.8	7.2	7.05	7.2	9.5
13	7.28	7.25	7.12	7.52	7.85	28	6.7	7.25	7.1	7.65	9.15
14	6.8	7.1	6.95	7.8	8.35	29	6.85	7.25	7.35	7.58	9.35
15	7.02	7.25	6.85	7.8	8.2	30	6.78	7.0	7.1	7.28	10.75
						31	6.9	.....	7.1	.....	9.65

NOTE.—Ice conditions prevailed Dec. 10-31. The gage readings were probably to water surface.

MOHAWK RIVER.

GENERAL FEATURES OF AREA DRAINED.

Mohawk River, the largest tributary of the Hudson, rises in the sandy hills south of Booneville, in western New York, about 40 miles from the east end of Lake Ontario. Its uppermost tributaries are fed by large springs. The river receives also considerable water brought in from the adjacent Black River drainage basin for the supply of Black River and Erie canals. The Mohawk flows southward until it reaches the city of Rome, at which point it turns toward the east, flowing across the State in a course nearly east until it enters the Hudson at Cohoes, a few miles above Troy. Its total length is about 140 miles, and its drainage area comprises 3,470 square miles.

The immediate valley of the Mohawk is broad and open, at many places a mile or two in width, and the flats which border the stream have a rich alluvial soil, finely adapted to the raising of grass, grains, and broom corn. Back from the flats there is a rise, in most places gradual but locally abrupt, to hills which attain altitudes several hundred feet above the stream. The more elevated lands are covered with sandy and gravelly loam. Toward the mouth of the river the valley becomes more contracted and the meadows disappear.

Above Rome the Mohawk flows through a deep gorge in shale rock. From Rome eastward to Little Falls the valley is deeply filled with alluvial deposits, and the flood plains on either side become submerged during freshets, thus acting to some extent as storage reservoirs. At Little Falls the river cuts through a rocky gorge, whose walls rise precipitously 500 or 600 feet.

Below Rome the river has a small and rather uniform fall and is characterized by long, quiet reaches with slight riffles, but at Little Falls this uniformity is broken and the stream descends in a succes-

sion of falls about 45 feet in half a mile. The average fall between Rome and the lower aqueduct at Crescent, a distance of 110.7 miles, is 2.43 feet per mile; thence to the level of slack water above Troy dam there is a farther descent of 149.5 feet in 4.4 miles, but of this 105 feet is included within the improved power at Cohoes.

The Erie Canal parallels Mohawk River and derives a part of its water supply from it. The new barge canal, at present under construction by the State of New York, will utilize by canalization the greater portion of the river between Albany and Utica. The water supply for the new canal in the section between Syracuse and Utica will to a large extent come from the Mohawk. A high dam is being constructed across the Mohawk at Delta, 6 miles north of Rome, which will form a large reservoir to supply the summit level of the canal near Rome. This supply will be supplemented by a reservoir on West Canada Creek at Hinckley, discharging by a conduit into Ninemile Creek and thence to the Rome summit level.

Important tributaries of the Mohawk are West and East Canada and Schoharie creeks.

West Canada Creek rises in West Canada Lake, in southwest-central Hamilton County and flows in a southerly direction into the Mohawk at Herkimer. Its drainage area, comprising approximately 583 square miles, contains about 50 small lakes and ponds and a small amount of artificial storage, which, with the numerous swamps and marshes in the region of the headwaters, serve to make the regimen of flow fairly uniform. A considerable part of the basin is timber covered. The underlying rock is granitic gneiss in the upper portion of the basin, with limestone in some places. Heavy accumulations of snow occur during the winter. At Trenton Falls is an important plant of the Utica Gas & Electric Co. There is much undeveloped power on this stream.

East Canada Creek rises in Hamilton County and flows southward between Herkimer and Fulton counties, joining the Mohawk at East Creek. In a general way its drainage basin is similar to that of West Canada Creek, although its flow is less sustained and regular.

Schoharie Creek has its source in the Catskills, about 2 miles east of Tannersville, at an elevation of 1,940 feet. The drainage basin is generally irregular. In places its slopes are almost precipitous, and it is extensively forest covered. The overlying rocks are slaty and allow but a slight depth of percolation. The soil is generally of clay. The total drainage area is 909 square miles.

MOHAWK RIVER AT LITTLE FALLS, N. Y.

At Little Falls are three dams: The upper is the State dam diverting water for the supply of the Erie Canal; the lower two are used for water-power development. Records of discharge have been

obtained at the lower (Gilbert's) dam since 1898. These records were originally collected by the United States Geological Survey in cooperation with the State engineer department, and are now maintained wholly by the latter.

Information in regard to this station and records of discharge for 1910 are contained in the 1910 report of the State engineer and surveyor, State of New York.

MOHAWK RIVER AT DUNSBACH FERRY, N. Y.

This station, which is located at the dam of the West Troy Water Co., a short distance above Dunsbach Ferry bridge, 9 miles from the mouth of the river, was established March 12, 1898, in connection with a system of levels by the United States Board of Engineers on Deep Waterways, by D. J. Howell, who has furnished the earlier portion of the record. The station is now maintained by the State of New York.

Information in regard to this station and records of discharge for 1910 are contained in the 1910 report of the State engineer and surveyor, State of New York.

WEST CANADA CREEK AT TWIN ROCK BRIDGE, NEAR GRANT, N. Y.

This station, which is located at the highway bridge about 2 miles above Hinckley and about one-half mile below the outlet of Black Creek, was established September 7, 1900. The station is now maintained by the New York State engineer department. Discharge data are obtained by the current-meter method.

Information in regard to this station and records of discharge for 1910 are contained in the 1910 annual report of the State engineer and surveyor, State of New York.

WEST CANADA CREEK AT KAST BRIDGE, N. Y.

This station, which is located on the highway bridge about 4 miles above the outlet of West Canada Creek and about 3 miles above the village of Herkimer, N. Y., was established May 15, 1905. The station is now maintained by the New York State engineer department. Data on discharge are obtained by the current-meter method.

Information in regard to this station and records of discharge for 1910 are contained in the 1910 annual report of the State engineer and surveyor, State of New York.

EAST CANADA CREEK AT DOLGEVILLE, N. Y.

This station, which is located at the dam of the Herkimer County Light & Power Co., about 7 miles above the outlet of the stream at High Falls, near the village of Dolgeville, N. Y., was established

September 23, 1898. The station is now maintained by the New York State engineer department.

Information in regard to this station and records of discharge for 1910 are contained in the 1910 report of the State engineer and surveyor, State of New York.

SCHOHARIE CREEK AT PRATTSVILLE, N. Y.

This station, which is located at the single-span steel highway bridge at Prattsville, N. Y., was established November 7, 1902, by the United States Geological Survey. On May 7, 1907, it was assumed by the Board of Water Supply of the city of New York, by which the following tables of discharge were supplied.

The gage is attached to the floor of the bridge on the upstream side near the left bank. The chain length is 27.05 feet. The elevation of the datum of the gage is 1,130.03 feet (United States Geological Survey benchmark). The gage datum is referred to a benchmark—a circle of white paint marked on a bowlder at the right end of the downstream side of the bridge; elevation 1,151 feet, or 20.97 feet above the datum of the gage. On May 7, 1907, a new standard board of water-supply chain gage was established in place of the old one, which was dilapidated and unwieldy. The old datum was preserved and the present readings conform to those already obtained. The gage is read each morning and evening by Miss Edna M. Snyder, of Prattsville, N. Y.

The bridge is 187.8 feet between abutments, and all the water passes between the abutments at all but the very highest stages.

High-stage measurements are made from the bridge; low-stage measurements may be made by wading at a point about 500 feet below the bridge.

It is believed that Schoharie Creek is practically unaffected by fluctuation of stage due to storage above Prattsville.

Information in regard to this station is also contained in the reports of the State engineer and surveyor, State of New York.

Daily discharge, in second-feet, of Schoharie Creek at Prattsville, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	43	335	5,020	945	801	275	161	41	31	50	88	205
2	48	310	3,760	721	721	305	153	41	31	48	73	193
3	48	295	2,388	600	649	265	131	48	43	43	66	217
4	43	285	1,610	512	999	217	125	71	61	41	98	217
5	43	265	1,360	488	785	225	118	57	61	41	705	235
6	165	255	1,380	512	635	512	109	52	61	43	572	275
7	500	464	3,115	1,500	551	404	106	50	61	43	512	285
8	324	452	1,400	865	677	320	101	52	59	48	380	255
9	308	422	1,107	635	512	285	98	52	57	48	285	240
10	272	368	930	551	494	315	95	57	48	48	530	240
11	214	295	897	440	434	600	90	75	50	52	999	217
12	178	285	753	1,053	368	705	80	68	39	48	621	197
13	165	310	558	600	335	551	66	57	78	46	446	157
14	160	295	530	530	295	452	61	52	115	39	386	157
15	133	285	476	488	270	368	61	48	80	41	335	140

Daily discharge, in second-feet, of Schoharie Creek at Prattsville, N. Y., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	150	255	446	440	265	628	68	50	63	39	325	140
17	143	494	416	410	225	857	61	48	48	43	330	122
18	133	691	416	1,887	235	1,775	59	39	43	41	285	93
19	410	600	404	2,450	217	1,323	59	61	57	39	235	80
20	365	600	464	2,050	185	1,080	57	52	48	43	193	80
21	640	1,305	990	1,170	205	649	57	52	41	39	193	45
22	12,000	1,450	817	865	185	494	57	43	37	43	185	45
23	2,450	801	850	691	181	428	57	41	35	61	181	25
24	1,450	551	1,014	565	193	380	52	39	57	52	193	1,350
25	1,080	446	1,690	1,323	193	315	50	43	52	52	201	769
26	833	452	2,000	12,860	209	240	52	39	71	50	205	500
27	691	1,850	1,278	2,800	235	250	48	43	61	66	181	440
28	512	8,030	1,017	1,650	193	285	68	41	73	106	177	470
29	446	.....	990	1,215	142	250	61	41	66	98	177	470
30	350	.....	1,251	1,017	165	217	59	39	61	95	177	1,950
31	350	.....	1,341	.....	118	.....	57	39	.....	85	.....	621

Monthly discharge of Schoharie Creek at Prattsville, N. Y., for 1910.

[Drainage area, 240 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).[a]
	Maximum.	Minimum.	Mean.	Per square mile.[a]	
January	12,000	43	796	3.32	3.83
February	8,030	255	802	3.34	3.48
March	5,020	404	1,312	5.47	6.31
April	12,860	410	1,394	5.81	6.48
May	999	118	376	1.57	1.81
June	1,775	217	499	2.08	2.32
July	161	48	80	.333	.38
August	75	39	49	.204	.24
September	115	31	56	.233	.26
October	106	39	53	.221	.25
November	999	66	311	1.30	1.45
December	1,950	25	337	1.40	1.61
The year	12,860	25	501	2.09	28.42

[a] Computed by engineers of the U. S. Geological Survey.

KINDERHOOK CREEK AT ROSSMAN, N. Y.

Kinderhook Creek is an interstate stream, with a drainage area of 337 square miles, having its source in the Hancock Mountains in western Massachusetts, at an elevation of nearly 1,500 feet above tide, flowing southwestward through Columbia and Rensselaer counties, N. Y., and joining Claverack Creek, about 2 miles from Hudson River, to form Stockport Creek, through which it discharges into the Hudson, 4 miles north of the village of Hudson. Kinderhook Creek is an important stream for power, with considerable amounts unutilized, and affords also some opportunities for storage.

The gaging station, which is located at the highway bridge near Rossman, N. Y., about 7 miles northeast of Hudson, was established March 17, 1906.

The only important tributary above the station—Valatie Kill—enters at Valatie, about 7 miles distant.

About one-eighth mile above the station, at Chittenden Falls, are two mills, only one of which is at present in use. The river has also been developed at two points above Rossman—at Stuyvesant Falls and Kinderhook, distant, respectively, about 2 and 5 miles.

A box gage of the tape and weight type is located on the highway bridge. The datum of the gage has remained unchanged during the maintenance of the station.

Discharge measurements are made from the bridge or by wading.

During the winter the discharge is affected by the presence of ice.

Conditions for obtaining accurate discharge measurements are good, and a very good discharge rating curve has been developed. The flow, however, is controlled by the mill and power plants above the gaging station, particularly at low stages, and hence the mean daily gage heights which are derived from three daily readings are liable to considerable error.

Information in regard to this station is contained in the reports of the State engineer and surveyor, State of New York.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Discharge measurements of Kinderhook Creek at Rossman, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 22[a]	W. G. Hoyt	155	1,300	34.56	11,000
Apr. 26	do	148	339	28.05	909
Aug. 25[b]	J. J. Phelan	13	9.85	26.36	38.1

[a] Measurement largely estimated for 70 feet near right bank of river was full of floating ice; velocity here determined by timing ice cakes.
[b] Measurement made by wading in tailrace of power plant above, giving total flow under bridge.

ESOPUS CREEK.

GENERAL FEATURES OF AREA DRAINED.

Esopus Creek has its source in northwestern Ulster County and enters Hudson River near Saugerties. The course of the upper portion of the stream is southeastward, but at Binnewater it turns abruptly to the northeast and for a distance of about 20 miles the

course of the creek lies parallel to that of Hudson River, though the two streams flow in opposite directions. At Kingston the creek is 2.5 miles from the Hudson and at an elevation of 140 feet above sea level.

The stream is characterized by a number of precipitous falls, which occur chiefly at points where it passes from one geologic formation to another. At Olivebridge it falls 28 feet, at Glen Eyrie 56 feet, and at Saugerties it makes its descent to the tidewater level of the Hudson in an abrupt fall of about 40 feet.

Esopus Creek is to be used as a source of water supply by New York City by placing a masonry dam 210 feet in maximum height near Browns station, where the drainage area is 255 square miles. The Ashokan reservoir, so formed, will have a storage capacity of about 17,000,000,000 cubic feet, and at first about 250,000,000 gallons of water per day will be carried through the Catskill aqueduct to New York City, about 100 miles distant. Eventually portions of Rondout, Catskill, and Schoharie creeks are to be included in the supply, raising this to 500,000,000 gallons daily.

ESOPUS CREEK NEAR OLIVEBRIDGE, N. Y.

During 1906 a weir for the purpose of measuring the flow of Esopus Creek was constructed near Olivebridge, N. Y., by the Board of Water Supply of the City of New York. It is located about 1 mile below the Olivebridge post office. The following description and discharge data have been furnished by the Board of Water Supply of the City of New York.

The weir is constructed of concrete, having a cross section similar to that experimented on in the hydraulic laboratory at Cornell University by the United States Geological Survey, in series 30, described in Water-Supply Papers 150 and 200.

The average height of this weir above the rock on which it is founded, for its entire length, is 7.54 feet; length between abutments, 193.90 feet. In order to form a channel of approach the abutments have been extended upstream at right angles with the axis of the weir for a distance of 16 feet, and the area of the channel of approach below the crest of the weir is 1,462 square feet. The abutments extend 14 feet above the level of the crest, and it is estimated that a flow of 40,000 cubic feet per second can be taken care of.

Measurements of the head on the weir are made in a well 24 inches in diameter, situated 53 feet upstream from the crest of the weir. Water is admitted to this well through a ¾-inch pipe extending 16 feet out into the stream in which, spaced 6 inches apart, are ⅛-inch holes bored vertically through the pipe. The center of this pipe is placed 18 inches above the bed of the stream. A continuous record of the head at this point is kept by means of a Friez automatic water-stage register, geared 1 to 1 and running 24 hours. Observations of the

flow were first begun on October 17, 1906, though the automatic gage register was not installed until December 5. Prior to this latter date heads were read three times daily and reduced in the usual manner.

Computations of the discharge over this weir are made from a formula which has been deduced from the results of the experiments made by the United States Geological Survey and referred to above. During the winter the ice which forms between the wing walls which constitute the channel of approach is kept cut away so that there may be no change in the conditions of flow due to this cause.

The use of the automatic gage eliminates from determinations of daily discharge any error that might result from slight fluctuation in daily stage caused by power control above Olivebridge.

The drainage area of Esopus Creek above the weir is 239 square miles, as measured on the topographic maps of the United States Geological Survey.

Information in regard to this station is contained in the reports of the New York State engineer and surveyor.

Daily discharge, in second-feet, of Esopus Creek at weir near Olivebridge, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	220	502	5,157	1,302	1,110	228	182	53	40	57	36	115
2	242	406	4,185	1,047	974	222	172	53	50	57	36	105
3	228	430	3,108	884	928	201	162	58	94	57	58	105
4	185	418	2,337	808	1,048	194	162	60	105	57	158	105
5	248	406	1,974	753	856	182	127	110	130	57	454	90
6	502	304	1,939	738	757	535	127	95	108	53	278	75
7	917	332	2,900	1,229	689	342	113	80	142	57	200	100
8	722	370	2,310	909	625	294	110	67	120	72	166	105
9	588	327	1,720	754	618	256	111	54	122	66	143	75
10	488	284	1,341	662	548	308	94	43	108	58	142	110
11	395	240	1,109	590	501	552	102	80	100	58	187	194
12	338	234	961	684	440	615	111	80	78	53	200	225
13	338	228	931	576	400	546	81	74	72	43	175	225
14	311	222	925	534	358	475	72	68	78	43	162	220
15	280	216	782	498	333	428	64	62	234	43	148	202
16	246	210	690	484	312	470	62	56	144	48	140	175
17	259	210	630	464	278	637	84	50	116	43	138	162
18	315	210	548	4,612	292	891	60	45	110	38	136	130
19	330	210	536	4,538	275	806	62	74	89	38	128	115
20	352	210	705	2,885	249	653	62	70	89	36	119	90
21	3,213	1,465	973	1,976	267	554	67	67	78	36	112	124
22	11,496	1,270	1,006	1,466	246	470	67	64	62	38	114	146
23	3,424	880	1,146	1,171	235	406	72	62	62	48	110	510
24	1,945	690	1,408	969	242	358	86	61	62	48	110	348
25	1,391	578	2,481	2,741	258	316	84	60	118	44	126	228
26	1,007	505	2,730	15,388	282	288	72	61	112	44	130	340
27	861	1,040	1,874	4,392	247	271	67	61	100	44	114	300
28	720	4,372	1,472	2,492	228	281	59	60	94	44	110	355
29	658	.....	1,418	1,754	208	232	55	59	94	44	123	565
30	582	.....	1,778	1,415	215	210	53	58	72	40	126	350
31	538	.....	1,710	.....	228	.....	53	58	.....	40	.....	531

NOTE.—On Apr. 26 occurred the maximum flow, 28,100 second-feet; it was maintained for 15 minutes.

Monthly discharge of Esopus Creek at Olivebridge, N. Y., for 1910.

[Drainage area, 239 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).[a]
	Maximum.	Minimum.	Mean.	Per square mile.[a]	
January	11,496	185	1,077	4.51	5.20
February	4,372	210	606	2.54	2.64
March	5,157	536	1,704	7.13	8.22
April	15,388	464	1,958	8.19	9.14
May	1,110	208	460	1.92	2.21
June	891	182	407	1.70	1.90
July	182	53	92	.385	.44
August	110	43	65	.272	.31
September	234	40	101	.423	.47
October	72	36	48	.201	.23
November	454	36	146	.611	.68
December	565	75	210	.879	1.01
The year	15,388	36	573	2.40	32.46

[a] Computed by engineers of the U. S. Geological Survey.

ESOPUS CREEK AT MOUNT MARION, N. Y.

The Mount Marion station was established April 4, 1907, by the Board of Water Supply of the city of New York. A continuous record of gage heights has been kept by John Sauer, of Saugerties, who reads the gage morning and evening. The description and following records of discharge were supplied by the Board of Water Supply of the city of New York.

This station is located on the single-span steel highway bridge at a place called Pleasant Valley, on the Saugerties road, 1 mile east of the Mount Marion station of the West Shore Railroad.

The banks of the creek on both sides are high, steep, and rocky. The right bank is about 40 feet above water level; the left is at least 100 feet high. The channel is straight for about 1,000 feet above and about 600 feet below the station. The bed is ledge rock with the strata steeply inclined, giving jagged corners and an irregular but permanent cross section.

A standard Board of Water Supply gage is attached to the downstream side of the bridge. The length of the chain from end of weight to marker is 49.01 feet. The bench mark is a chisel draft on the bridge seat of the left abutment, downstream side, near the lower chord. The elevation of the bench mark is 46.30 feet above the zero of the gage. The initial point of soundings is located on the handrail of the bridge near the left bank of the stream, downstream side, and is marked with black paint.

In May, 1908, the flooring of the bridge was renewed, but provision was made for the continuance of accurate gage heights during this short period.

At very low stages the current at the bridge station is too sluggish for good measurements. A wading station was therefore established about three-fourths of a mile above the bridge and about three-fourths of a mile below Glen Eyrie Falls. The Kingston-Saugerties road parallels the creek on the right bank and the station is 200 feet from the road. The banks on both sides are of the same character as at the bridge. The bed of the stream is gravelly and liable to some change; under certain conditions there may be two channels. This station is used only when the depth of water does not exceed 3 feet. The current is swift and good measurements are obtained at this point; gage heights are referred to the bridge gage.

Such slight fluctuation in daily stage at Marion as may be caused by power control above probably introduces no material error in determinations of daily discharge.

In May, 1902, several measurements were taken at this bridge by the United States Geological Survey. It was then called the Glasco bridge near Glen Eyrie.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor, State of New York.

Daily discharge, in second-feet, of Esopus Creek at Mount Marion, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	155	900	10,440	1,815	1,995	395	288	80	63	105	68	169
2	130	675	7,660	1,470	1,590	375	273	80	80	94	68	155
3	120	735	5,970	1,245	1,430	345	255	80	108	87	91	146
4	120	715	4,675	1,105	1,887	318	229	115	182	80	138	138
5	135	665	3,730	1,049	1,510	312	210	155	187	74	575	130
6	180	585	3,660	979	1,315	1,245	195	135	187	74	515	122
7	247	222	5,620	1,486	1,140	979	182	111	234	83	347	119
8	640	190	4,675	1,510	1,021	735	173	97	210	94	288	108
9	525	282	3,385	1,210	965	650	164	91	177	87	265	101
10	440	310	2,560	1,070	1,000	575	164	119	159	87	206	91
11	395	222	2,067	930	840	750	155	169	135	80	222	72
12	340	222	1,923	1,105	735	1,210	155	187	111	74	222	66
13	340	210	1,833	951	685	1,374	146	164	105	74	222	78
14	395	200	1,833	840	600	965	138	135	135	74	215	91
15	320	222	1,617	768	550	810	130	115	151	68	210	97
16	318	235	1,430	715	515	840	135	108	146	68	200	104
17	290	246	1,350	715	467	1,140	141	101	138	68	191	72
18	267	270	1,161	4,600	443	1,486	138	94	125	68	182	72
19	510	285	1,161	11,160	467	1,617	130	111	115	68	177	84
20	690	295	1,259	6,600	435	1,231	122	101	108	68	164	78
21	605	455	1,860	3,898	455	1,000	115	101	101	63	151	72
22	18,000	1,370	1,815	2,700	403	810	108	94	101	68	146	72
23	8,060	1,035	1,905	2,040	363	675	108	94	94	87	146	72
24	5,668	790	2,130	1,635	387	565	101	87	91	80	146	91
25	2,676	640	2,916	3,060	415	485	101	87	97	74	151	392
26	1,923	605	4,010	24,700	675	427	97	87	119	68	164	273
27	1,653	700	2,796	10,848	550	395	87	80	155	68	159	189
28	1,390	5,712	2,130	4,870	455	427	80	74	141	63	155	189
29	1,257	.....	1,923	3,125	415	387	80	68	125	68	159	234
30	1,105	.....	2,130	2,480	395	324	80	63	115	68	169	450
31	965	.....	2,260	.....	427	.....	80	58	.....	68	.....	410

NOTE.—Ice existed Jan. 1 to 22 and Feb. 7 to 27.

Monthly discharge of Esopus Creek at Mount Marion, N. Y., for 1910.

[Drainage area, 378 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).[a]
	Maximum.	Minimum.	Mean.	Per square mile.[a]	
January	18,000	120	1,608	4.25	4.90
February	5,712	190	678	1.79	1.86
March	10,440	1,161	3,029	8.01	9.24
April	24,700	715	3,356	8.88	9.91
May	1,995	363	791	2.09	2.41
June	1,617	312	761	2.01	2.24
July	238	80	147	.389	.45
August	187	58	105	.278	.32
September	234	63	133	.352	.39
October	105	63	76	.201	.23
November	575	68	204	.540	.60
December	450	66	146	.386	.44
The year	24,700	58	920	2.43	32.99

[a] Computed by engineers of the United States Geological Survey.

RONDOUT CREEK AT ROSENDALE, N. Y.

Rondout Creek rises in the timber-covered mountain group forming the Wittemberg Chain, flows southeastward to Naponach, where it encounters the foot of the Shawangunk Range, turns abruptly to the northeast, and enters the Hudson at Rondout. On the south its basin is separated from that of Wallkill River only by the narrow Shawangunk Mountain. Notable falls occur at Honk Falls and Naponach, and on Good Beer Kill above Ellenville. On Good Beer Kill there is a fall of 870 feet from the cape, 3 miles above Ellenville, to Ellenville. Of this about 200 feet is concentrated in a series of cascades called Hanging Rock Falls. Above its junction with Sandberg Creek, at Naponach, Rondout Creek is a mountain stream. At Honk Falls a natural declivity affords a fall of 125 feet.

The gaging station, which is located on the highway bridge at Rosendale, was established by the United States Geological Survey on July 6, 1901. It was assumed by the Board of Water Supply of the City of New York on June 1, 1907, at which time a new standard Board of Water Supply chain gage was put in to replace the old one. This description and the following tables of discharge for 1910 were furnished by the Board of Water Supply of the City of New York.

Measurements are taken from the bridge at high and medium stages and by wading at a point about 1,000 feet below the bridge at low stages.

The gage is located on the downstream side of the bridge in the middle panel. The length of the chain from end of weight to marker is 34.53 feet. The bench mark is a circular cut on rock on upstream corner, right abutment. The elevation is 33.56 feet above the datum.

The water is confined to one channel under the single-span steel bridge, which is 135.7 feet between abutments at all stages.

A portion of the water of the creek is diverted by a dam below High Falls and sent through the Delaware & Hudson Canal and is discharged into the creek below the gaging station. At Rock Locks, which is about 1½ miles below Rosendale, there is an overflow weir, from which the approximate discharge of the canal may be obtained. The weir, which has a crest of 3.8 feet, is located at the left end of the lock and is equipped with a standard Board of Water Supply staff gage.

Slight daily fluctuations in the stage of Rondout Creek at Rosendale are caused by storage at Honk Falls, Napanoch, and, to some extent, at High Falls. In determining the daily discharge for this station, proper allowance is made for the water diverted to the Delaware & Hudson Canal.

Information in regard to this station is contained in the report of the State engineer and surveyor, State of New York.

Daily discharge, in second-feet, of Rondout Creek at Rosendale, N. Y. (including Delaware & Hudson Canal), for 1910.

Date.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	165	853	9,000	1,127	1,542	581	244	62	76	100	79	298
2	155	789	6,600	893	1,317	533	208	76	94	108	85	280
3	133	757	5,700	765	1,146	509	178	85	141	82	141	250
4	165	717	4,200	757	1,692	485	154	108	437	85	581	232
5	122	677	3,660	813	1,435	523	138	232	501	108	1,832	220
6	128	677	3,358	757	1,112	1,912	141	186	398	120	933	220
7	621	677	4,800	1,015	988	1,225	116	162	328	120	525	250
8	920	320	4,400	983	932	829	112	135	292	108	509	262
9	672	305	3,078	897	998	798	100	100	256	141	469	268
10	448	294	2,318	762	971	869	108	162	232	147	445	232
11	330	254	1,928	698	861	837	154	1,490	208	116	445	208
12	282	280	1,677	657	772	1,046	147	421	190	100	437	190
13	290	294	2,000	618	700	1,073	135	250	186	88	429	190
14	305	255	1,545	586	556	983	141	178	186	85	405	190
15	350	224	1,391	537	540	901	135	141	186	76	391	186
16	320	224	1,479	538	540	829	154	144	182	85	377	170
17	290	252	1,290	618	548	757	150	123	162	88	370	170
18	348	272	1,145	4,059	539	741	144	116	141	85	352	170
19	560	300	1,046	5,609	516	709	147	108	150	82	304	170
20	290	629	983	3,422	492	661	150	178	150	85	220	170
21	860	901	2,120	2,637	490	581	154	141	150	85	220	170
22	15,525	3,800	1,952	1,771	457	501	147	108	141	88	292	170
23	6,500	2,120	1,892	1,259	443	429	135	129	123	100	310	178
24	3,162	1,271	2,266	1,070	437	377	100	108	116	100	316	1,110
25	2,156	1,028	2,565	1,575	549	310	82	82	100	100	352	685
26	1,490	1,253	3,050	19,510	524	268	66	85	91	100	316	430
27	1,370	1,154	2,144	6,708	509	244	82	88	108	100	304	364
28	1,190	6,600	1,743	3,757	509	244	70	82	116	94	298	377
29	983	.....	1,523	3,084	493	238	58	88	120	82	310	493
30	933	.....	1,435	1,984	597	244	60	108	116	79	310	813
31	901	.....	1,253	.....	621	.....	62	85	.....	79	.....	773

NOTE.—Water let into canal Apr. 5. Ice present Jan. 1 to 22 and Feb. 8 to 21.

Monthly discharge of Rondout Creek at Rosendale, N. Y. (including Delaware and Hudson Canal), for 1910.

[Drainage area, 380 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).[a]
	Maximum.	Minimum.	Mean.	Per square mile.[a]	
January	15,525	122	1,354	3.56	4.10
February	6,600	224	970	2.55	2.66
March	9,000	983	2,695	7.09	8.17
April	19,510	537	2,315	6.09	6.80
May	1,692	437	768	2.02	2.33
June	1,912	238	674	1.77	1.98
July	244	58	128	.337	.39
August	1,490	62	180	.474	55
September	501	76	189	.497	55
October	147	76	97	.255	.29
November	1,832	79	412	1.08	1.20
December	1,110	170	319	.839	.97
The year	19,510	58	841	2.21	29.99

[a] Computed by engineers of the United States Geological Survey.

PASSAIC RIVER.

GENERAL FEATURES OF AREA DRAINED.

Passaic River rises in Somerset and Morris counties, N. J. Above its confluence with Pompton River, its main tributary, it meanders through a flat country of Triassic red sandstone, to which in large measure must be attributed the turbidity of its waters. In contrast with the sluggish, muddy Passaic, the Pompton is a rapid stream and its waters are clear. It drains parts of Sussex, Passaic, Morris, and other adjoining counties, and traverses for a large part of its course a country of hard crystalline rocks and heavy forests, the general level of which is several hundred feet above that of the Passaic. At their confluence the Pompton enters with a current which carries it well toward the right bank of the Passaic, and at times of flood causes much backwater in the latter.

The highest recorded flood which has occurred in this drainage basin was that of October, 1903. The flood began at 6.30 p. m., October 8, and lasted until midnight, October 18, the maximum height being reached at 9 p. m., October 10. There was a total rainfall of 11.74 inches between October 8 and 11. The estimated maximum discharge at the Dundee dam was 35,800 second-feet. This flood is fully described in Water-Supply Paper 92.

PASSAIC RIVER NEAR CHATHAM, N. J.

This station was established February 10, 1903, and is maintained by the United States Weather Bureau. It is located at the second bridge, about 1½ miles upstream from Chatham.

No important tributaries enter in the immediate vicinity of the station. Canoe Brook enters from the east about 3 miles below the station.

The datum of the chain gage attached to the bridge has remained the same since the station was established.

Discharge measurements are made from the bridge or by wading.

The discharge is affected by ice during the winter months.

Conditions of flow remained permanent at this station from 1903 to 1905–6. Some time during 1905–6 a change took place which was equivalent to a constant change in gage height of about 0.1 foot. Since that time the discharge rating curve has remained constant down to September 5, 1909. On this date a check measurement was made, the gage verified, and everything found correct. Since that date the station has not been visited. Comparisons of gage-height records at other points in the Passaic drainage indicate, however, that the gage datum and the conditions of flow during 1910 were essentially the same as in 1909. The following tables of discharge were accordingly developed from the 1909 discharge rating curve.

Daily gage height, in feet, of Passaic River near Chatham, N. J., for 1910.

[Miss M. A. Butler, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	2.2	3.2	2.3	2.4	2.0	2.2	2.1	2.2	2.2
2	.....	.....	.....	2.2	3.0	2.3	2.4	2.0	2.4	2.1	2.1	2.2
3	.....	.....	.....	2.2	2.8	2.3	2.3	2.2	2.3	2.1	2.1	2.2
4	.....	.....	7.0	2.2	2.7	2.3	2.3	2.4	2.3	2.1	3.5	2.2
5	.....	.....	6.0	2.1	2.5	2.2	2.3	2.4	2.3	2.0	3.9	2.1
6	.....	.....	5.5	2.1	2.4	2.5	2.2	2.3	2.2	2.0	3.6	2.1
7	.....	.....	5.0	2.1	2.3	2.4	2.2	2.3	2.2	2.0	3.2	2.1
8	.....	.....	4.7	2.1	2.3	2.4	2.2	2.2	2.2	2.0	2.8	2.1
9	.....	.....	4.4	2.1	2.3	2.3	2.2	2.2	2.2	2.0	2.6	2.1
10	.....	.....	4.1	2.1	2.3	2.3	2.2	2.2	2.2	2.0	2.5	2.1
11	.....	.....	3.8	2.1	2.3	2.5	2.2	2.4	2.2	2.0	2.4	.....
12	.....	.....	3.5	2.1	2.2	2.8	2.2	2.4	2.2	2.0	2.4	.....
13	.....	.....	3.3	2.1	2.2	3.0	2.2	2.3	2.2	2.0	2.3	.....
14	.....	.....	3.1	2.1	2.2	2.8	2.2	2.3	2.1	2.0	2.3	.....
15	.....	.....	2.9	2.1	2.2	2.7	2.1	2.3	2.1	2.0	2.2	.....
16	.....	.....	2.7	2.1	2.2	2.6	2.1	2.3	2.1	2.0	2.2	.....
17	.....	.....	2.6	2.1	2.2	2.5	2.1	2.3	2.1	2.0	2.2	.....
18	.....	.....	2.5	2.6	2.2	2.4	2.1	2.2	2.1	2.0	2.2	.....
19	.....	.....	2.4	3.4	2.2	4.0	2.1	2.2	2.1	2.0	2.2	.....
20	.....	.....	2.4	3.5	2.2	3.9	2.1	2.2	2.1	2.2	2.2	.....
21	.....	.....	2.3	3.1	2.3	3.7	2.1	2.2	2.1	2.3	2.2	.....
22	.....	.....	2.3	2.8	2.8	3.6	2.1	2.2	2.1	2.3	2.2	.....
23	6.0	.....	2.3	2.6	2.8	3.5	2.1	2.2	2.1	2.3	2.1	.....
24	5.8	.....	2.2	2.4	2.6	3.3	2.1	2.2	2.1	2.2	2.1	.....
25	5.5	.....	2.2	3.0	2.4	3.0	2.1	2.1	2.1	2.2	2.1	3.8
26	5.2	.....	2.2	4.0	2.7	2.8	2.1	2.1	2.1	2.2	2.1	3.8
27	4.8	.....	2.2	3.8	2.6	2.7	2.0	2.1	2.1	2.2	2.1	3.5
28	4.5	.....	2.2	3.6	2.5	2.6	2.0	2.1	2.1	2.2	2.1	3.0
29	4.2	.....	2.2	3.5	2.4	2.5	2.0	2.1	2.1	2.2	2.2	2.8
30	.....	.....	2.2	3.4	2.4	2.4	2.0	2.1	2.1	2.2	2.3	2.6
31	.....	.....	2.2	.....	2.4	.....	2.0	2.1	.....	2.2	.....	2.4

NOTE.—Relation between gage height and discharge affected by ice from Jan. 1 to 22, Jan. 30 to Mar. 3, and Dec. 11 to 24.

Daily discharge, in second-feet, of Passaic River near Chatham, N. J., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	20	235	31	45	8	20	12	20	20
2	.....	.....	.....	20	172	31	45	8	45	12	12	20
3	.....	.....	.....	20	119	31	31	20	31	12	12	20
4	.....	.....	2,260	20	97	31	31	45	31	12	350	20
5	.....	.....	1,660	12	60	20	31	45	31	8	525	12
6	.....	.....	1,360	12	45	60	20	31	20	8	390	12
7	.....	.....	1,090	12	31	45	20	31	20	8	235	12
8	.....	.....	925	12	31	45	20	20	20	8	119	12
9	.....	.....	775	12	31	31	20	20	20	8	77	12
10	.....	.....	625	12	31	31	20	20	20	8	60	12
11	.....	.....	480	12	31	60	20	45	20	8	45	.....
12	.....	.....	350	12	20	119	20	45	20	8	45	.....
13	.....	.....	271	12	20	172	20	31	20	8	31	.....
14	.....	.....	202	12	20	119	20	31	12	8	31	.....
15	.....	.....	144	12	20	97	12	31	12	8	20	.....
16	.....	.....	97	12	20	77	12	31	12	8	20	.....
17	.....	.....	77	12	20	60	12	31	12	8	20	.....
18	.....	.....	60	77	20	45	12	20	12	8	20	.....
19	.....	.....	45	310	20	575	12	20	12	8	20	.....
20	.....	.....	45	350	20	525	12	20	12	20	20	.....
21	.....	.....	31	202	31	435	12	20	12	31	20	.....
22	.....	.....	31	119	119	390	12	20	12	31	20	.....
23	1,660	.....	31	77	119	350	12	20	12	31	12	.....
24	1,540	.....	20	45	77	271	12	20	12	20	12	.....
25	1,360	.....	20	172	45	172	12	12	12	20	12	480
26	1,200	.....	20	575	97	119	12	12	12	20	12	480
27	980	.....	20	480	77	97	8	12	12	20	12	350
28	825	.....	20	390	60	77	8	12	12	20	12	172
29	675	.....	20	350	45	60	8	12	12	20	20	119
30	.....	.....	20	310	45	45	8	12	12	20	31	77
31	.....	.....	20	.....	45	.....	8	12	.....	20	.....	45

NOTE.—Daily discharge determined from a discharge rating curve well defined below 600 second-feet.

Monthly discharge of Passaic River near Chatham, N. J., for 1910.

[Drainage area, 101 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,660	.....	354	3.50	4.04	D.
February	.....	.....	152	1.50	1.56	D.
March	2,260	20	507	5.02	5.79	A.
April	575	12	123	1.22	1.36	A.
May	225	20	58.8	.582	.67	A.
June	575	20	141	1.40	1.56	A.
July	45	8	17.6	.174	.20	B.
August	45	8	23.1	.229	.26	B.
September	45	12	17.4	.172	.19	B.
October	31	8	14.2	.141	.16	B.
November	525	12	74.5	.738	.82	A.
December	480	.....	67.6	.669	.77	C.
The year	2,260	8	129	1.28	17.38	

NOTE.—The discharge during the periods of obstruction by ice is based on climatologic records.
Mean discharge, Jan. 1 to 22, estimated 84 second-feet.
Mean discharge, Jan. 30 to 31, estimated 450 second-feet.
Mean discharge, Mar. 1 to 3, estimated 1,670 second-feet.
Mean discharge, Dec. 11 to 24, estimated 16 second-feet.

DELAWARE RIVER.

GENERAL FEATURES OF AREA DRAINED.

The headwaters of Delaware River are found in Delaware, Greene, and Schoharie counties, N. Y. The East Branch, which may be considered the main stream, rises at Grand Gorge in northeastern Delaware County; the West Branch [1] has its source in a small lake almost on the line of Schoharie and Delaware counties, at an elevation of 1,886 feet above sea level; the two streams unite at Hancock. From this junction point the river flows southeastward until it reaches Port Jervis, where it turns to the southwest and flows for a distance of about 40 miles along the base of the Shawangunk Range until it passes through the water gap, from which point it flows in an irregular southerly direction to Trenton. Below Trenton its course is in general southwestward to Delaware Bay. Between Hancock and Port Jervis it forms the dividing line between New York and Pennsylvania; south of Port Jervis it separates Pennsylvania from New Jersey and, for a few miles, Delaware from New Jersey.

The drainage area of Delaware River, measured at Philadelphia and including that of Schuylkill River, is about 10,100 square miles, of which about 2,580 square miles lie in New York, 5,720 in Pennsylvania, and 1,800 in New Jersey. The river is tidal to Trenton, which lies also at the head of navigation.

The Delaware receives a number of important tributaries, among which may be mentioned Mongaup and Navesink rivers and Callicoon Creek from New York; Lackawaxen, Lehigh, and Schuylkill rivers and numerous creeks from Pennsylvania; and Rancocas Creek, Musconetcong River, and Maurice River from New Jersey.

EAST BRANCH OF DELAWARE RIVER AT HANCOCK, N. Y.

This station, which is located at the highway bridge half a mile southeast of the Erie Railroad station at Hancock, N. Y., and about 1 mile above the junction of the East and West branches of Delaware River, was established October 14, 1902, and has since been maintained in cooperation with the New York State engineer department, and with the United States Weather Bureau since January 1, 1908. The Erie Railroad bridge is just below the gaging station.

Beaver Kill, which drains a portion of Sullivan and Ulster counties, is the nearest important tributary to East Branch of Delaware River. It enters from the left about 10 miles above the gaging station.

The datum of the chain gage attached to the bridge has remained the same since the establishment of the station.

Discharge measurements are made from the bridge or by wading.

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[1] This branch was formerly described as the main stream, but recent careful measurements show the drainage area of the East Branch to be considerably larger than that of the West Branch.

Conditions for accurate measurements can be considered fairly good. The high-water stage of East Branch is probably affected at times by backwater caused by gorging at its junction with West Branch. Low-water discharge is controlled by a riffle just below the Erie Railroad bridge, but frequent changes in conditions of flow may require many measurements and new ratings each year. During 1910 the channel probably did not change materially and results for this year are considered good. During the winter months the discharge is affected by needle and cake ice jamming on these riffles and causing backwater at the station.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor, State of New York.

Discharge measurements of East Branch of Delaware River at Hancock, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 1[a]	W. G. Hoyt	.....	22,300	9.13	16,500
3	do	342	1,890	7.73	11,400
5	do	318	1,400	6.15	6,500
8	do	324	1,500	6.48	7,730
May 10	C. C. Covert	304	738	3.91	1,600
July 28[b]	Hoyt and Carman	152	224	2.70	262

[a] Measurement partly estimated; large cakes of ice running.
[b] Measurement made by wading above bridge.

Daily gage height, in feet, of East Branch of Delaware River at Hancock, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.6	3.9	9.7	5.2	5.0	3.8	3.1	2.6	2.4	2.7	2.5	3.2
2	3.4	4.0	8.9	4.9	4.7	3.7	3.1	2.6	2.4	2.7	2.5	3.2
3	3.7	3.8	7.8	4.7	4.7	3.7	3.0	2.6	2.4	2.7	2.5	3.2
4	3.6	3.7	6.9	4.4	4.8	3.5	3.0	2.6	3.1	2.6	2.6	3.1
5	3.4	3.8	6.2	4.4	4.5	3.4	2.9	2.8	3.4	2.6	2.7	3.3
6	3.5	3.6	6.1	4.3	4.4	3.6	2.9	2.7	3.3	2.6	2.9	3.4
7	4.1	4.5	7.0	4.3	4.2	4.1	2.9	2.7	3.4	2.6	3.1	3.4
8	5.4	4.6	6.9	4.6	4.1	3.8	2.9	2.6	3.3	2.6	3.1	3.5
9	5.2	4.7	6.0	4.6	4.1	3.6	2.8	2.6	3.1	2.6	3.0	3.4
10	5.1	4.9	5.5	4.3	4.0	3.6	2.8	2.6	3.0	2.6	3.0	3.3
11	5.0	4.6	5.1	4.1	3.8	3.7	2.9	2.8	2.9	2.4	3.3	3.8
12	4.9	4.7	4.9	4.2	3.7	4.1	2.9	2.9	2.8	2.4	3.8	3.8
13	4.8	4.6	4.7	4.4	3.7	4.0	2.8	2.8	2.9	2.5	3.6	3.7
14	4.7	4.7	4.8	4.1	3.6	3.9	2.7	2.7	2.8	2.5	3.5	3.6
15	4.7	4.8	4.6	4.0	3.5	3.8	2.7	2.6	3.0	2.5	3.5	3.6
16	4.7	4.7	4.4	4.1	3.5	3.7	2.7	2.5	2.9	2.5	3.4	3.7
17	4.6	4.7	4.5	3.9	3.4	4.0	2.8	2.5	2.9	2.5	3.3	3.6
18	4.7	4.8	4.2	3.9	3.4	3.9	2.8	2.5	2.7	2.5	3.3	3.6
19	5.0	4.9	4.2	5.8	3.5	4.3	2.7	2.6	2.7	2.5	3.3	3.7
20	5.7	4.9	4.4	5.0	3.4	4.1	2.7	2.8	2.7	2.5	3.2	3.7
21	5.6	5.0	5.2	4.8	3.3	3.8	2.7	2.7	2.6	2.5	3.2	3.7
22	12.9	6.7	5.2	4.6	3.5	3.7	2.7	2.6	2.6	2.6	3.1	3.6
23	8.0	7.0	5.0	4.5	3.4	3.6	2.7	2.6	2.6	2.6	3.1	3.5
24	6.2	6.0	5.5	4.3	3.3	3.5	2.7	2.6	2.6	2.6	3.1	3.6
25	5.4	5.9	6.0	4.3	3.8	3.4	2.7	2.5	2.7	2.5	3.2	5.0
26	4.9	5.6	7.1	6.1	4.8	3.3	2.6	2.5	2.8	2.5	3.3	4.6
27	4.6	5.6	6.3	7.8	4.4	3.3	2.6	2.5	2.8	2.5	3.2	4.4
28	4.4	7.8	5.7	6.2	4.3	3.3	2.7	2.5	2.8	2.5	3.2	4.4
29	4.3	.....	5.5	5.6	4.0	3.4	2.7	2.5	2.8	2.5	3.2	4.3
30	4.0	.....	5.6	5.4	3.9	3.3	2.7	2.4	2.8	2.5	3.2	4.4
31	4.0	.....	5.5	.....	3.8	.....	2.7	2.4	.....	2.5	.....	4.6

NOTE.—Ice present at this station from Jan. 1 to about Jan. 21, from about Feb. 5 to 27, and from about Dec. 5 to 31. It is not known whether the gage readings were to water surface or to top of ice.
Gage heights for Jan. 1 to May 9 corrected for error in chain length.

Daily discharge, in second-feet, of East Branch of Delaware River at Hancock, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,570	19,200	4,290	3,800	1,400	525	198	113	248	153	620
2	.....	1,750	16,200	3,570	3,120	1,240	525	198	113	248	153	620
3	.....	1,400	12,300	3,120	3,120	1,240	440	198	113	248	153	620
4	.....	1,240	9,290	2,490	3,340	965	440	198	525	198	198	525
5	.....	.....	7,040	2,490	2,690	840	367	304	840	198	248	.....
6	.....	.....	6,730	2,300	2,490	1,100	367	248	725	198	367	.....
7	.....	.....	9,620	2,300	2,110	1,930	367	248	840	198	525	.....
8	.....	.....	9,290	2,900	1,930	1,400	367	198	725	198	525	.....
9	.....	.....	6,430	2,900	1,930	1,100	304	198	525	198	440	.....
10	.....	.....	5,050	2,300	1,750	1,100	304	198	440	198	440	.....
11	.....	.....	4,040	1,930	1,400	1,240	367	304	367	113	725	.....
12	.....	.....	3,570	2,110	1,240	1,930	367	367	304	113	1,400	.....
13	.....	.....	3,120	2,490	1,240	1,750	304	304	367	153	1,100	.....
14	.....	.....	3,340	1,930	1,100	1,570	248	248	304	153	965	.....
15	.....	.....	2,900	1,750	965	1,400	248	198	440	153	965	.....
16	.....	.....	2,490	1,930	965	1,240	248	198	367	153	840	.....
17	.....	.....	2,690	1,570	840	1,750	304	153	367	153	725	.....
18	.....	.....	2,110	1,570	840	1,570	304	153	248	153	725	.....
19	.....	.....	2,110	5,860	965	2,300	248	198	248	153	725	.....
20	.....	.....	2,490	3,800	840	1,930	248	304	248	153	620	.....
21	.....	.....	4,290	3,340	725	1,400	248	248	198	153	620	.....
22	31,600	.....	4,290	2,900	965	1,240	248	198	198	198	525	.....
23	13,000	.....	3,800	2,690	840	1,100	248	198	198	198	525	.....
24	7,040	.....	5,050	2,300	725	965	248	198	198	198	525	.....
25	4,790	.....	6,430	2,300	1,400	840	248	153	248	153	620	.....
26	3,570	.....	9,950	6,730	3,340	725	198	153	304	153	725	.....
27	2,900	.....	7,360	12,300	2,490	725	198	153	304	153	620	.....
28	2,490	12,300	5,580	7,040	2,300	725	248	153	304	153	620	.....
29	2,300	.....	5,050	5,310	1,750	840	248	153	304	153	620	.....
30	1,750	.....	5,310	4,790	1,570	725	248	113	304	153	620	.....
31	1,750	.....	5,050	.....	1,400	.....	248	113	.....	153	.....	.....

NOTE.—Daily discharge determined from a discharge rating curve well defined.

Daily discharge Jan. 21, Feb. 21–27, and Dec. 5–10 as published in the New York State report for 1910, has been revised. Daily discharge for missing winter periods not published in Federal report as it is only approximate.

Monthly discharge of East Branch of Delaware River at Hancock, N. Y., for 1910.

[Drainage area, 920 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	31,600	.....	2,480	2.70	3.11	C.
February	12,300	.....	1,510	1.64	1.71	C.
March	19,200	2,110	6,200	6.74	7.77	A.
April	12,300	1,570	3,440	3.74	4.17	A.
May	3,800	725	1,750	1.91	2.20	A.
June	2,300	725	1,280	1.39	1.55	A.
July	525	198	307	.334	.39	A.
August	367	113	208	.226	.26	A.
September	840	113	359	.390	.44	A.
October	248	113	174	.189	.22	A.
November	1,400	153	600	.652	.73	A.
December	.....	.....	450	.489	.56	D.
The year	31,600	113	1,560	1.70	23.11	

NOTE.—Discharge for periods during which ice existed estimated from discharge at Port Jervis and Riegelsville.

Mean discharge Jan. 1 to 21 estimated 270 second-feet; nearly constant.

Mean discharge Feb. 5 to 27 estimated 1,050 second-feet; slight variation.

Mean discharge Dec. 5 to 31 estimated 427 second-feet; nearly constant.

Determination of discharge for January, February, and December in the above table is revised and supersedes that published in the New York State report for 1910.

DELAWARE RIVER AT PORT JERVIS, N. Y.

This station, which is located at the toll bridge over Delaware River at Port Jervis, was established for the United States Weather Bureau by Irving Righter, city engineer, Port Jervis, N. Y., October 12, 1904, and is maintained to obtain data for flood predictions.

Mongaup River enters the Delaware from the north about 6 miles above the station, and Neversink River, also from the north, enters about 1 mile below the station.

The chain gage is attached to the bridge. Considerable difficulty has been experienced in maintaining the datum of the gage constant. On September 4, 1908, after a careful investigation, the datum was changed about 2 feet in order to avoid negative readings. The new elevation of the datum of the gage is 414.89 feet above mean sea level. A correction varying from +1.7 to +2.0 feet has been applied to gage heights prior to September 4, 1908, so that all gage heights published by the Survey refer to the same datum.

Discharge measurements are made from the bridge.

The relation between gage height and discharge is affected by ice to a greater or less extent each winter. At times ice gorges form below the bridge.

Conditions of flow at this point are constant, and a good discharge rating curve has been developed.

Comparisons of the records of this station with those obtained at the Riegelsville and the two Hancock stations indicate that the corrections applied to the gage heights were essentially correct and that all discharge data can be fully relied on.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor, State of New York.

Discharge measurements of Delaware River at Port Jervis, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. [a] 1	W. G. Hoyt	646	7,850	±11.8	59,300
[b] 2	do	641	6,760	10.9	48,800
[b] 3	do	646	6,190	9.82	41,400
[c] 4	do	646	5,730	8.55	32,200
7	do	628	5,490	8.14	28,900
9	do	627	4,860	7.25	22,600
10	do	626	4,360	6.38	17,300
May 10	C. C. Covert	579	2,880	3.91	5,650
July 30	Hoyt and Carman	460	891	1.37	654

[a] Velocity estimated by timing ice cakes from a measured line on shore.
[b] Large amount of ice flowing, but measurements probably unaffected thereby.
[c] Vertical velocity curves taken every 25 feet and measurement computed, using mean from curves.

Daily gage height, in feet, of Delaware River at Port Jervis, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.3	3.4	13.0	4.6	5.6	3.6	2.4	1.3	1.0	1.5	1.1	2.2
2	2.1	3.3	11.2	4.2	4.4	3.4	2.3	1.4	1.2	1.4	1.1	2.1
3	2.1	3.3	10.4	4.0	4.1	3.3	2.2	1.3	1.2	1.4	1.1	2.1
4	2.3	3.2	8.7	3.7	4.6	3.2	2.2	1.3	1.3	1.2	1.4	2.0
5	2.3	3.1	7.9	3.5	4.7	3.1	2.0	1.4	1.7	1.1	2.0	2.0
6	2.3	2.9	7.5	3.2	4.6	3.1	2.0	1.2	2.2	1.0	2.2	2.0
7	2.5	2.5	8.1	3.9	4.4	3.8	2.0	1.3	2.2	1.0	2.2	2.4
8	2.8	2.1	9.0	4.1	4.4	3.7	1.9	1.3	2.1	1.0	2.1	2.3
9	3.9	2.5	7.7	4.1	3.7	3.5	1.8	1.4	2.1	0.9	2.2	2.0
10	3.9	2.7	6.6	3.8	3.4	3.3	1.8	1.4	1.8	0.8	2.3	2.0
11	3.7	3.1	5.8	3.4	4.0	3.4	1.7	2.7	1.7	0.8	2.2	2.8
12	3.6	3.1	5.5	3.4	3.8	4.0	1.7	2.4	1.6	0.8	2.1	2.8
13	3.6	3.1	5.3	3.7	3.6	4.2	1.7	1.9	1.5	0.8	3.1	2.7
14	3.6	3.0	5.3	3.5	3.4	4.0	1.7	1.8	1.4	0.7	2.8	2.6
15	3.5	3.0	5.1	3.2	3.2	3.6	1.6	1.6	1.4	0.7	2.7	2.5
16	3.5	2.7	4.8	3.2	3.1	3.5	1.6	1.4	1.4	0.7	2.5	.....
17	5.3	2.7	4.6	3.1	3.0	3.5	1.6	1.3	1.4	0.7	2.5	.....
18	3.3	2.7	4.3	3.4	2.9	3.9	1.5	1.2	1.4	0.7	2.3	.....
19	3.4	2.6	4.0	5.3	2.7	3.9	1.7	1.3	1.3	0.7	2.3	3.1
20	3.5	2.6	4.0	5.6	2.6	3.8	2.0	1.3	1.2	1.1	2.2	2.9
21	4.1	3.1	5.6	5.1	2.9	3.6	2.0	1.4	1.2	1.1	2.1	2.8
22	9.4	3.3	6.0	4.9	2.9	3.3	1.5	1.4	1.2	1.1	2.1	2.6
23	10.9	5.0	5.7	4.7	2.9	3.1	1.5	1.3	1.1	1.2	2.0	2.6
24	7.5	4.7	5.5	4.6	2.8	2.8	1.5	1.3	1.1	1.1	2.0	3.0
25	6.1	4.5	6.3	4.5	3.2	2.6	1.4	1.2	1.0	1.1	2.0	3.2
26	6.1	4.5	7.0	7.2	4.1	2.4	1.4	1.1	1.2	1.3	2.0	3.2
27	4.7	4.1	6.5	9.3	5.1	2.4	1.3	1.1	1.2	1.2	2.2	4.4
28	4.1	4.5	6.3	7.1	4.5	2.5	1.3	1.1	1.6	1.2	2.1	3.9
29	4.1	.....	6.0	6.1	4.3	2.7	1.2	1.0	1.5	1.2	2.1	4.0
30	3.9	.....	5.2	5.8	3.8	2.6	1.4	1.0	1.5	1.1	2.2	4.1
31	3.4	.....	4.8	.....	3.6	.....	1.3	1.0	.....	1.1	.....	9.7

NOTE.—Ice present at this station from about Jan. 1 to about Jan. 21, from Feb. 11 to 15, and from about Dec. 7 to 31. Relation between gage height and discharge may also have been slightly affected by ice Feb. 9, 10, and 16 to 20. On Dec. 31 there was backwater of 5 to 6 feet, caused by an ice jam. It is not known whether gage readings during these periods were to water surface or to top of ice.

Daily discharge, in second-feet, of Delaware River at Port Jervis, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4,100	67,300	8,120	12,500	4,670	1,900	590	390	740	450	1,570
2	.....	3,830	52,500	6,620	7,350	4,100	1,730	665	520	665	450	1,420
3	.....	3,830	46,000	5,930	6,270	3,830	1,570	590	520	665	450	1,420
4	.....	3,570	32,700	4,970	8,120	3,570	1,570	590	590	520	665	1,280
5	.....	3,320	26,800	4,380	8,520	3,320	1,280	665	920	450	1,280	1,280
6	.....	2,860	23,900	3,570	8,120	3,320	1,280	520	1,570	390	1,570	1,280
7	.....	2,080	28,200	5,600	7,350	5,280	1,280	590	1,570	390	1,570	.....
8	.....	1,420	35,000	6,270	7,350	4,970	1,150	590	1,420	390	1,420	.....
9	.....	2,080	25,300	6,270	4,970	4,380	1,030	665	1,420	330	1,570	.....
10	.....	2,450	18,000	5,280	4,100	3,830	1,030	665	1,030	275	1,730	.....
11	.....	2,500	13,500	4,100	5,930	4,100	920	2,450	920	275	1,570	.....
12	.....	2,500	12,100	4,100	5,280	5,930	920	1,900	825	275	1,420	.....
13	.....	2,500	11,100	4,970	4,670	6,620	920	1,150	740	275	3,320	.....
14	.....	2,500	11,100	4,380	4,100	5,930	920	1,030	665	225	2,650	.....
15	.....	2,500	10,200	3,570	3,570	4,670	825	825	665	225	2,450	.....
16	.....	2,450	8,930	3,570	3,320	4,380	825	665	665	225	2,080	.....
17	.....	2,450	8,120	3,320	3,080	4,380	825	590	665	225	2,080	.....
18	.....	2,450	6,980	4,100	2,860	5,600	740	520	665	225	1,730	.....
19	.....	2,260	5,930	11,100	2,450	5,600	920	590	590	225	1,730	.....
20	.....	2,260	5,930	12,500	2,260	5,280	1,280	590	520	450	1,570	.....
21	.....	3,320	12,500	10,200	2,860	4,670	1,280	665	520	450	1,420	.....
22	38,100	3,830	14,600	9,350	2,860	3,830	740	665	520	450	1,420	.....
23	50,100	9,780	13,000	8,520	2,860	3,320	740	590	450	520	1,280	.....
24	23,900	8,520	12,100	8,120	2,650	2,650	740	590	450	450	1,280	.....
25	15,100	7,730	16,200	7,730	3,570	2,260	665	520	390	450	1,280	.....

Daily discharge, in second-feet, of Delaware River at Port Jervis, N. Y., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	15,100	7,730	20,500	21,800	6,270	1,900	665	450	520	590	1,280	.....
27	8,520	6,270	17,400	37,300	10,200	1,900	590	450	520	520	1,570	.....
28	6,270	7,730	16,200	21,200	7,730	2,080	590	450	825	520	1,420	.....
29	6,270	.....	14,600	15,100	6,980	2,450	520	390	740	520	1,420	.....
30	5,600	.....	10,700	13,500	5,280	2,260	665	390	740	450	1,570	.....
31	4,100	.....	8,930	.....	4,670	.....	590	390	.....	450	.....	.....

NOTE.—Daily discharge determined from a discharge rating curve well defined below discharge 70,000 second-feet. Discharge Feb. 11 to 15 estimated from discharge at Riegelsville.

All determinations have been revised by means of a new discharge rating curve and supersede those published for this station in the New York State report for 1910.

Monthly discharge of Delaware River at Port Jervis, N. Y., for 1910.

[Drainage area, 3,250 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	50,100	.....	6,260	1.93	2.22	B.
February	9,780	1,420	3,890	1.20	1.25	A.
March	67,300	5,930	19,600	6.03	6.95	A.
April	37,300	3,320	8,850	2.72	3.04	A.
May	12,500	2,260	5,420	1.67	1.92	A.
June	6,620	1,900	4,040	1.24	1.38	A.
July	1,900	520	990	.305	.35	A.
August	2,450	390	709	.218	.25	A.
September	1,570	390	752	.231	.26	A.
October	740	225	413	.127	.15	A.
November	3,320	450	1,520	.468	.52	A.
December	.....	.....	1,500	.462	.53	C.
The year	67,300	225	4,500	1.38	18.82	

NOTE.—Discharge for periods during which ice existed estimated from the discharge at Riegelsville.

Mean discharge Jan. 1 to 21 estimated 1,000 second-feet; practically constant.

Mean discharge Dec. 7 to 31 estimated 1,530 second-feet; nearly constant.

Determinations of discharge made by means of a new discharge rating curve and supersede those published in the New York State report for 1910.

DELAWARE RIVER AT RIEGELSVILLE, N. J.

This station, which is located at the toll suspension bridge between Riegelsville, N. J., and Riegelsville, Pa., was established July 3, 1906, to take the place of the station at Lambertville, N. J., where conditions of flow were unfavorable for obtaining accurate results.

Lehigh River enters the Delaware from the west about 9 miles above Riegelsville, and Musconetcong comes in from the east about 600 feet below the measuring section. The Musconetcong does not, however, materially affect the relation of gage height to discharge, except at rare intervals.

The Delaware division of the Pennsylvania Canal, running from Easton, Pa., to Bristol, Pa., utilizes part of the total flow of the river at Riegelsville. It diverts water from the Lehigh at its mouth, and at low stages takes practically the entire discharge of this tributary. The water is turned out of this canal during the winter period, or from

about the middle of December to the last of March, but throughout the remainder of the year the discharge averages about 250 to 300 second-feet.

The datum of the chain gage attached to the bridge has remained the same during the continuance of the station. This gage was checked with a level in January, 1912, and gage heights for July to December have been corrected.

Discharge measurements are made from the bridge. The discharge is affected by ice only during severe winters.

Conditions for obtaining accurate discharge data are very good, and an excellent discharge rating curve has been developed.

No discharge measurement was made during 1910. Comparisons of the records of flow with those at Port Jervis and Hancock, N. Y., show that full reliance can be placed in the estimates of monthly discharge at Riegelsville.

Daily gage height, in feet, of Delaware River at Riegelsville, N. J., for 1910.

[John H. Deemer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.20	5.02	17.85	6.51	9.24	4.95	3.6	2.15	2.2	2.15	1.9	3.0
2	2.62	4.70	18.76	6.06	8.29	4.76	3.4	2.15	2.25	2.2	1.85	2.9
3	2.78	4.69	17.49	5.62	7.51	4.64	3.3	2.25	2.3	2.15	1.95	2.85
4	2.48	4.61	14.91	5.28	7.06	4.64	3.1	2.25	2.65	2.1	2.5	2.7
5	2.50	4.44	13.12	5.15	6.92	4.34	3.1	2.25	2.7	2.0	3.2	2.65
6	2.52	3.95	12.05	5.01	6.61	4.70	3.0	2.3	2.7	1.95	3.4	2.65
7	2.95	3.34	12.45	5.09	6.15	5.01	2.85	2.2	2.9	2.0	3.4	2.65
8	3.30	3.49	14.85	5.50	5.75	5.10	2.95	2.2	3.0	1.95	3.2	2.65
9	3.02	3.69	12.71	5.42	5.68	4.78	3.0	2.45	2.85	1.9	3.1	2.3
10	3.35	3.78	11.10	5.11	5.79	4.54	2.85	2.45	2.8	1.95	3.0	2.4
11	3.69	3.68	9.52	4.84	5.66	4.81	2.95	2.55	2.6	1.95	2.9	2.45
12	3.60	3.54	8.62	4.66	5.51	5.20	2.85	3.4	2.5	1.9	2.85	2.35
13	3.41	3.84	8.15	4.56	5.12	5.79	2.75	3.0	2.45	1.8	3.1	2.2
14	3.39	3.79	8.16	4.60	4.91	5.62	2.65	2.7	2.4	1.85	3.6	2.35
15	3.15	3.82	8.00	4.56	4.61	5.15	2.65	2.6	2.75	1.8	3.4	2.4
16	2.98	3.85	7.36	4.31	4.54	4.86	2.5	2.7	2.45	1.8	3.2	2.35
17	3.01	3.96	6.91	4.22	4.36	5.24	2.5	2.45	2.35	1.8	3.1	2.3
18	3.10	4.75	6.71	6.01	4.26	5.41	2.65	2.4	2.3	1.8	3.0	2.25
19	3.32	4.38	6.29	9.78	4.22	5.99	2.6	2.3	2.3	1.8	2.95	2.5
20	3.68	4.15	6.21	9.84	4.18	5.69	2.55	2.2	2.25	1.85	2.75	2.6
21	3.71	6.65	6.82	9.02	4.49	5.62	2.55	2.25	2.2	1.85	2.75	2.3
22	14.20	8.75	7.98	8.14	4.60	5.00	2.55	2.25	2.2	1.85	2.8	2.35
23	18.90	8.06	7.92	7.35	4.36	4.60	2.55	2.35	2.1	1.8	2.75	2.3
24	12.96	7.19	7.66	6.89	4.35	4.29	2.45	2.2	2.05	2.0	2.7	2.7
25	10.10	6.82	7.94	9.49	5.12	4.02	2.45	2.15	2.05	2.0	2.9	2.55
26	8.26	6.18	8.46	11.92	6.14	3.82	2.4	2.15	1.95	1.95	2.65	3.6
27	7.41	6.25	9.50	15.19	7.02	3.79	2.35	2.05	2.0	1.9	2.7	3.5
28	6.75	8.01	8.11	12.68	6.70	3.69	2.4	1.85	2.15	2.0	2.9	3.7
29	6.30	.....	7.29	10.36	6.15	3.58	2.3	1.95	2.15	1.9	3.0	3.8
30	5.56	.....	6.82	9.86	5.59	3.70	2.2	2.1	2.15	1.75	2.95	4.0
31	5.35	.....	6.58	.....	5.18	.....	2.05	1.95	.....	1.8	.....	3.9

NOTE.—River frozen over at gage and gage heights taken to the top of the ice Jan. 1 to 9. The gage heights were also probably affected by ice lodged on the control point below the gage from Jan. 10 to 21. Ice freshet Jan. 23. River partly or wholly frozen over from about Dec. 5 to Dec. 23. Gage heights taken to top of ice Dec. 12 to 14. Except as noted gage readings during the winter were to water surface.

Water restored to canal Mar. 10 and withdrawn from canal Dec. 9.

Daily discharge, in second-feet, of Delaware River at Riegelsville, N. J., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,460	9,570	86,500	15,100	27,900	9,330	5,080	1,740	1,830	1,740	1,350	3,500
2	2,110	8,490	93,500	13,300	23,000	8,690	4,530	1,740	1,920	1,830	1,280	3,260
3	2,390	8,460	83,800	11,700	19,300	8,290	4,260	1,920	2,010	1,740	1,420	3,140
4	1,820	8,190	64,600	10,500	17,400	8,290	3,750	1,920	2,700	1,660	2,400	2,810
5	1,920	7,640	51,900	10,000	16,800	7,320	3,750	1,920	2,810	1,500	4,000	2,700
6	2,020	6,100	44,700	9,530	15,500	8,490	3,500	2,010	2,810	1,420	4,530	2,700
7	2,700	4,370	47,400	9,810	13,700	9,530	3,140	1,830	3,260	1,500	4,530	2,700
8	3,410	4,770	64,200	11,200	12,200	9,840	3,380	1,830	3,500	1,420	4,000	2,700
9	2,840	5,330	49,100	11,000	11,900	8,750	3,500	2,300	3,140	1,350	3,750	2,010
10	2,500	5,590	38,700	9,880	12,300	7,960	3,140	2,300	3,030	1,420	3,500	2,200
11	2,100	5,300	29,400	8,960	11,800	8,850	3,380	2,500	2,600	1,420	3,260	2,300
12	1,800	4,910	24,600	8,360	11,300	10,200	3,140	4,530	2,400	1,350	3,140	2,100
13	1,600	5,770	22,300	8,030	9,910	12,300	2,920	3,500	2,300	1,200	3,750	1,830
14	1,500	5,620	22,400	8,160	9,190	11,700	2,700	2,810	2,200	1,280	5,080	2,100
15	1,500	5,710	21,600	8,030	8,190	10,000	2,700	2,600	2,920	1,200	4,530	2,200
16	1,400	5,800	18,700	7,220	7,960	9,020	2,400	2,810	2,300	1,200	4,000	2,100
17	1,400	6,130	16,400	6,930	7,380	10,500	2,400	2,500	2,100	1,200	3,750	2,010
18	1,500	8,660	15,900	13,100	7,060	10,900	2,400	2,200	2,010	1,200	3,500	1,920
19	1,800	7,450	14,200	30,900	6,930	13,100	2,600	2,010	2,010	1,200	3,380	2,400
20	2,000	6,710	13,900	31,200	6,810	11,900	2,500	1,830	1,920	1,280	2,920	2,600
21	5,000	15,600	16,300	26,700	7,800	11,700	2,500	1,920	1,830	1,280	2,920	2,010
22	59,500	25,300	21,500	22,300	8,160	9,500	2,500	1,920	1,830	1,280	3,030	2,100
23	94,600	21,900	21,200	18,600	7,380	8,100	2,500	2,100	1,660	1,200	2,920	2,010
24	50,800	17,900	20,000	16,600	7,350	7,100	2,200	1,830	1,580	1,500	2,810	2,810
25	32,700	16,300	21,300	29,200	9,910	6,310	2,300	1,740	1,580	1,500	3,260	2,500
26	22,900	13,800	23,800	43,900	13,600	5,710	2,200	1,740	1,420	1,420	2,700	5,080
27	18,900	14,100	29,300	66,700	17,200	5,620	2,100	1,580	1,500	1,350	2,810	4,800
28	16,100	21,600	22,100	48,900	15,800	5,330	2,200	1,280	1,740	1,500	3,260	5,360
29	14,200	.....	18,400	34,200	13,700	5,020	2,010	1,420	1,740	1,350	3,500	5,650
30	11,500	.....	16,300	31,300	11,600	5,360	1,830	1,660	1,740	1,130	3,380	6,250
31	10,700	.....	15,400	.....	10,100	.....	1,580	1,420	.....	1,200	.....	5,950

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Discharge from Jan. 1 to 9 reduce 1 10 per cent and the discharge from Jan. 10 to 21 estimated by means of climatologic records. Although ice collecting on the control point at the lower end of the pool in which the Riegelsville gage is located may have caused slight backwater from about Feb. 8 to 20, no reduction was made in the computed discharge. Slight backwater caused by ice may have existed from about Dec. 6 to 24, but the general relation of gage height to discharge was probably not changed during December, owing to the fact that the control point below the gage probably remained open, and hence no reduction was made in the computed discharge for this period.

Monthly discharge of Delaware River at Riegelsville, N. J., for 1910.

[Drainage area, 6,470 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	94,600	a 1,400	12,200	1.90	2.19	B.
February	25,300	4,370	9,900	1.54	1.60	A.
March	93,500	13,900	33,900	5.30	6.11	A.
April	66,700	6,930	19,400	3.05	3.40	A.
May	27,900	6,810	12,200	1.94	2.24	A.
June	13,100	5,020	8,820	1.41	1.57	A.
July	5,080	1,580	2,890	.491	.57	A.
August	4,530	1,420	2,100	.369	.43	A.
September	3,500	1,420	2,210	.386	.43	A.
October	1,830	1,130	1,380	.257	.30	A.
November	5,080	1,280	3,290	.554	.62	A.
December	6,250	1,830	3,030	.482	.56	B.
The year	94,600	1,130	9,270	1.47	20.02	

a Ice effect, estimated.

NOTE.—In order to determine the discharge per square mile and the run-off depth in inches, 270 second-feet were added Mar. 10 to Dec. 8, 1910, before computing the discharge per square mile. Hence the first three columns indicate the actual quantity of water available in the river, and the two remaining columns represent the actual run-off from the drainage area above Riegelsville, including the discharge of the canal See description, p 238.

WEST BRANCH OF DELAWARE RIVER AT HANCOCK, N. Y.

This station, which is located at the toll suspension bridge, half a mile west of the Erie Railroad station at Hancock, N. Y., and about 1 mile above the junction of East and West branches of Delaware River, was established October 15, 1902, and has since been maintained in cooperation with the New York State engineer department and with the United States Weather Bureau since January 1, 1908.

Oquaga Creek, which drains the eastern portion of Broome County, is the nearest important tributary to West Branch of Delaware River. It enters from the right, about 10 miles upstream from the gaging station.

The conditions of the channel are not favorable for accurate ratings.

The datum of the chain gage attached to the toll bridge has remained the same since the establishment of the station. Discharge measurements are made from the suspension bridge or by wading. The high-water stage is at times affected by backwater from East Branch of Delaware River. The low stage is controlled by riffles about 800 feet below the station, but frequent changes in conditions of the channel require many measurements and new ratings each year. During the winter months the discharge is affected considerably by ice conditions. The flood which occurred during the first part of March was accurately measured by means of several discharge measurements. These measurements show a considerable reduction in the discharge as compared with that of previous years, probably partially due to backwater from East Branch of Delaware River.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor, State of New York.

Discharge measurements of West Branch of Delaware River at Hancock, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 2[a]	W. G. Hoyt	400	2,180	9.91	16,700
3	do	280	1,480	7.81	9,080
4	do	242	1,060	6.36	4,790
9	do	230	992	6.06	4,190
May 10	C. C. Covert	222	683	4.60	1,680
July 27	Hoyt and Carman	152	862	2.63	117

[a] Ice floating during the measurement.

Daily gage height, in feet, of West Branch of Delaware River at Hancock, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.0	3.9	10.6	4.5	4.9	4.8	3.3	2.5	2.4	2.6	2.3	3.1
2	3.2	3.9	9.3	4.2	4.6	4.4	3.1	2.6	2.4	2.6	2.4	3.0
3	3.0	3.8	7.8	4.1	4.7	4.2	3.3	2.6	2.4	2.3	2.3	3.1
4	3.3	3.7	7.0	4.0	4.6	4.0	3.1	2.5	2.8	2.5	2.3	3.1
5	2.9	5.2	6.5	3.9	4.5	3.8	3.1	2.5	3.1	2.5	2.6	3.0
6	3.1	5.0	6.3	3.9	4.2	4.4	2.9	2.5	3.0	2.4	2.9	3.0
7	4.5	5.1	7.8	3.8	4.1	4.5	2.7	2.4	3.2	2.4	3.1	3.2
8	5.1	4.9	6.9	4.1	4.2	4.4	2.9	2.5	2.9	2.4	3.0	3.0
9	4.7	5.0	6.1	3.9	4.1	4.2	2.8	2.6	2.8	2.4	2.8	3.2
10	4.5	5.4	5.6	3.8	4.5	4.1	2.9	2.5	2.7	2.4	2.8	3.4
11	4.1	4.8	5.0	3.8	4.2	4.1	2.7	2.7	2.7	2.4	3.9	3.5
12	4.2	4.7	4.9	3.7	4.2	4.5	2.8	2.6	2.5	2.4	4.0	4.0
13	4.1	4.6	4.8	4.1	4.0	4.5	2.7	2.6	2.5	2.3	3.5	4.0
14	4.1	4.5	4.8	3.9	3.9	4.2	2.6	2.6	2.6	2.4	3.5	4.0
15	4.2	4.6	4.6	3.7	3.8	4.1	2.6	2.5	2.6	2.5	3.4	3.8
16	4.0	4.5	4.3	3.8	3.8	4.0	2.5	2.5	2.5	2.4	3.3	3.9
17	3.9	4.8	4.4	3.6	3.7	4.1	2.7	2.5	2.8	2.3	3.2	4.0
18	4.1	4.9	4.0	3.7	3.6	4.0	2.7	2.4	2.5	2.4	3.1	3.9
19	4.5	4.7	4.1	4.2	3.6	4.8	2.6	2.5	2.4	2.3	3.1	3.8
20	5.4	4.6	4.4	4.3	3.6	4.1	2.5	2.4	2.4	2.4	3.5	3.6
21	5.5	4.7	5.0	4.2	3.5	3.9	2.5	2.4	2.5	2.4	2.8	3.5
22	11.0	7.1	5.2	4.1	3.4	3.7	2.7	2.6	2.5	2.3	3.1	3.5
23	7.7	7.1	5.0	4.1	3.4	3.6	2.7	2.4	2.4	2.4	3.0	3.3
24	6.1	6.1	5.2	4.0	3.3	3.5	2.7	2.4	2.4	2.4	3.0	3.5
25	5.2	5.7	5.6	4.2	4.2	3.3	2.6	2.5	2.5	2.4	3.1	3.7
26	5.8	5.4	5.8	4.8	6.1	3.2	2.7	2.5	2.6	2.4	3.2	4.7
27	4.6	5.5	5.6	6.0	5.4	3.2	2.6	2.4	2.5	2.4	3.2	4.6
28	4.5	11.1	5.1	5.6	5.4	3.2	2.7	2.4	2.7	2.4	3.1	4.5
29	4.2	.....	4.8	5.1	4.7	3.3	2.6	2.4	2.6	2.5	3.1	4.5
30	3.5	.....	4.8	5.1	4.4	3.2	2.7	2.4	2.7	2.3	3.1	5.4
31	4.0	.....	4.5	.....	4.5	.....	2.6	2.4	.....	2.3	.....	5.2

NOTE.—Ice present from Jan. 1 to about Jan. 21, from about Feb. 5 to about Feb. 28, and from about Dec. 7 to 31. Relation of gage height to discharge probably affected by backwater from ice jam Feb. 28. It is not known whether gage readings were to water surface or to the top of the ice during these periods.

Gage heights Jan. 1 to May 10 corrected for error in chain length.

Daily discharge, in second-feet, of West Branch of Delaware River at Hancock, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	845	19,500	1,470	1,990	1,850	400	83	60	110	41	295
2	.....	845	14,400	1,130	1,590	1,350	295	110	60	110	60	250
3	.....	755	9,020	1,030	1,720	1,130	400	110	60	41	41	295
4	.....	670	6,500	935	1,590	935	295	83	175	83	41	295
5	.....	.....	5,150	845	1,470	755	295	83	295	83	110	250
6	.....	.....	4,680	845	1,130	1,350	210	83	250	60	210	250
7	.....	.....	9,020	755	1,030	1,470	140	60	345	60	295	.....
8	.....	.....	6,210	1,030	1,130	1,350	210	83	210	60	250	.....
9	.....	.....	4,220	845	1,030	1,130	175	110	175	60	175	.....
10	.....	.....	3,150	755	1,470	1,030	210	83	140	60	175	.....
11	.....	.....	2,130	755	1,130	1,030	140	140	140	60	845	.....
12	.....	.....	1,990	670	1,130	1,470	175	110	83	60	935	.....
13	.....	.....	1,850	1,030	935	1,470	140	110	83	41	525	.....
14	.....	.....	1,850	845	845	1,130	110	110	110	60	525	.....
15	.....	.....	1,590	670	755	1,030	110	83	110	83	460	.....
16	.....	.....	1,240	755	755	935	83	83	83	60	400	.....
17	.....	.....	1,350	595	670	1,030	140	83	175	41	345	.....
18	.....	.....	935	670	595	935	140	60	83	60	295	.....
19	.....	.....	1,030	1,130	595	1,850	110	83	60	41	295	.....
20	.....	.....	1,350	1,240	595	1,030	83	60	60	60	525	.....
21	.....	.....	2,130	1,130	525	845	83	60	83	60	175	.....
22	21,100	.....	2,440	1,030	460	670	140	110	83	41	295	.....
23	8,690	.....	2,130	1,030	460	595	140	60	60	60	250	.....
24	4,220	.....	2,440	935	400	525	140	60	60	60	250	.....
25	2,440	.....	3,150	1,130	1,130	400	110	83	83	60	295	.....

Daily discharge, in second-feet, of West Branch of Delaware River at Hancock, N. Y., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	3,560	.....	3,560	1,850	4,220	345	140	83	110	60	345	.....
27	1,590	.....	3,150	4,000	2,780	345	110	60	83	60	345	.....
28	1,470	8,000	2,280	3,150	2,780	345	140	60	140	60	295	.....
29	1,130	.....	1,850	2,280	1,720	400	110	60	110	83	295	.....
30	525	.....	1,850	2,280	1,350	345	140	60	140	41	295	.....
31	935	.....	1,470	.....	1,470	.....	110	60	.....	41	.....	.....

NOTE.—Daily discharge determined from a discharge rating curve fairly well defined. Assumed unaffected by ice except Feb. 28, for which date the discharge is estimated from the discharge of East Branch of of Delaware River.

All determinations revised on the basis of a new discharge rating curve, superseding those published in the New York State report for 1910.

Monthly discharge of West Branch of Delaware River at Hancock, N. Y., for 1910.

[Drainage area, 680 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	21,100	.....	1,590	2.34	2.70	C.
February	[a] 8,000	.....	972	1.43	1.49	D.
March	19,500	935	3,990	5.87	6.77	A.
April	4,000	595	1,230	1.81	2.02	A.
May	4,220	400	1,270	1.87	2.16	A.
June	1,850	345	969	1.43	1.60	A.
July	400	83	169	.249	.29	A.
August	140	60	82.8	.122	.14	B.
September	345	60	124	.182	.20	A.
October	110	41	61.9	.091	.10	B.
November	935	41	313	.460	.51	A.
December	.....	.....	295	.434	.50	D.
The year	21,100	41	925	1.36	18.48	

[a] Estimated.

NOTE.—Discharge for periods during which ice existed computed from the discharge of Delaware River at Port Jervis and at Riegelsville.

Mean discharge Jan. 1 to 21, estimated, 180 second-feet; practically constant.

Mean discharge Feb. 5 to 27, estimated, 700 second-feet; slight variation.

Mean discharge Dec. 7 to 31, estimated, 300 second-feet; nearly constant.

Determinations for this station published in the New York State report for 1910 revised by means of a new discharge rating curve.

MONGAUP RIVER NEAR RIO, N. Y.

This station, which is located at the steel highway bridge at Partridge ranch, near Rio, about 6 miles above Mongaup village and about 14 miles from Port Jervis, N. Y., was established December 8, 1906. The station is maintained by Charles H. Cooke, civil engineer, of New York City, in cooperation with the United States Geological Survey and the State engineer department of New York. On account of inability to obtain reliable gage readings, earlier observations at this station have not been published.

The bridge, to which the chain gage is attached, has a span of 140 feet. The stream flows in one channel at all stages and measurements are made from the downstream side of the bridge, or by wading.

The channel above the station is straight for about 500 feet and during low and medium stages is divided into two parts by a small island just above the bridge. The channel below the bridge is straight for about 200 feet, when it makes an abrupt turn to the right. The banks on either side are of medium height and overflow only during extreme high stages.

Conditions for measuring at this point are fairly good except in low stages, when the current becomes rather sluggish. Low-water measurements are usually made by wading at the ripples below the bridge. A good discharge rating curve has been developed for stages below 3 feet.

The gage heights are not materially affected by the operation of the small plants above the station.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor, State of New York.

The following discharge measurement was made in 1910 by C. C. Covert:

May 12: Width, 138 feet; area, 226 square feet, gage height, 1.63 feet, discharge, 364 second-feet.

Daily gage height, in feet, of Mongaup River near Rio, N. Y., for 1910.

[Mrs. C. S. Rolles, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.48	4.70	1.98	2.25	1.26	0.95	0.68	0.76	0.61	0.62	0.98
2	.....	1.46	4.95	1.85	2.05	1.25	.94	.70	.80	.59	.60	.92
3	.....	1.48	4.70	1.49	2.10	1.22	.88	.70	.86	.58	.72	.92
4	.....	1.38	4.40	1.60	2.20	1.16	.86	.72	1.10	.60	1.15	.98
5	.....	1.35	3.90	1.55	2.05	1.18	.89	.82	.99	.56	1.62	1.06
6	.....	1.32	3.55	1.56	2.02	1.75	.86	.75	.90	.61	1.55	1.12
7	.....	1.30	3.95	2.05	1.90	1.62	.82	.72	.86	.62	1.35	1.10
8	.....	1.52	3.80	1.98	1.78	1.30	.85	.72	.81	.72	1.15	1.22
9	.....	1.58	2.50	1.78	1.71	1.25	.82	.70	.74	.58	1.02	1.12
10	.....	1.58	2.25	1.80	1.75	1.40	.76	.66	.75	.59	1.00	1.09
11	.....	1.44	2.25	1.62	1.68	1.65	.80	1.25	.74	.64	1.04	.....
12	.....	1.48	2.21	1.55	1.62	1.70	.78	1.02	.72	.60	1.00	.....
13	.....	1.52	2.22	1.46	1.59	1.78	.75	.92	.72	.62	1.00	.....
14	.....	1.60	2.50	1.35	1.50	1.48	.74	.76	.72	.60	.98	.....
15	.....	1.58	2.28	1.45	1.45	1.42	.75	.75	.76	.62	.95	.....
16	.....	1.52	2.20	1.45	1.41	1.40	.76	.78	.71	.61	.89	.....
17	.....	1.55	2.08	1.50	1.40	1.45	.82	.78	.66	.60	.95	.....
18	.....	1.58	2.05	1.58	1.45	1.38	.91	.94	.70	.60	.91	.....
19	.....	1.56	2.00	2.82	1.50	1.32	.81	.90	.66	.55	.86	.....
20	.....	1.55	2.18	2.35	1.49	1.21	.75	.86	.69	.56	.86	.....
21	.....	1.58	2.68	2.00	1.48	1.12	.79	.80	.69	.59	.88	.....
22	6.30	2.42	2.58	1.80	1.50	1.08	.80	.72	.68	.71	.89	.....
23	3.35	2.39	2.45	1.68	1.44	1.02	.80	.75	.62	.66	.81	.....
24	2.55	2.38	2.55	1.65	1.59	1.00	.78	.75	.62	.64	.84	.....
25	2.16	2.22	2.52	2.15	1.60	.98	.70	.76	.61	.61	.90	.....
26	1.95	2.21	2.46	4.60	1.60	1.04	.68	.68	.62	.64	1.01	.....
27	1.95	2.05	2.18	3.45	1.48	.95	.68	.66	.70	.62	.99	.....
28	1.80	2.68	2.22	2.66	1.42	.98	.72	.64	.70	.60	.88	.....
29	1.68	.....	2.11	2.45	1.38	.98	.68	.65	.68	.61	1.02	.....
30	1.60	.....	2.00	2.50	1.29	.90	.70	.70	.61	.68	1.00	.....
31	1.62	.....	2.02	.....	1.22	.....	.70	.68	.....	.61	.....	.....

NOTE.—Ice present at this station from Jan. 1 to 22, from about Feb. 5 to about Feb. 27, and from about Dec. 4 to 31. Ice jam Jan. 22. Relation of gage height to discharge probably also affected by backwater from ice jam Feb. 28 to Mar. 8. Gage heights were probably read to water surface during the winter.

Daily discharge, in second-feet, of Mongaup River near Rio, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	292	3,040	548	710	206	100	42	56	32	33	109
2	.....	284	2,000	472	590	202	98	45	63	29	30	92
3	.....	292	1,500	296	620	192	81	45	77	28	49	92
4	.....	252	1,000	345	680	171	77	49	150	30	168	.....
5	.....	.....	1,000	322	590	178	84	68	112	26	355	.....
6	.....	.....	900	327	572	420	77	54	86	32	322	.....
7	.....	.....	900	590	500	355	68	49	77	33	240	.....
8	.....	.....	900	548	435	220	74	49	65	49	168	.....
9	.....	.....	880	435	400	202	68	45	52	28	122	.....
10	.....	.....	710	445	420	260	56	39	54	29	115	.....
11	.....	.....	710	355	385	370	63	202	52	36	129	.....
12	.....	.....	686	322	355	395	59	122	49	30	115	.....
13	.....	.....	692	284	340	435	54	92	49	33	115	.....
14	.....	.....	880	240	300	292	52	56	49	30	109	.....
15	.....	.....	728	280	280	268	54	54	56	33	100	.....
16	.....	.....	680	280	264	260	56	59	47	32	84	.....
17	.....	.....	608	300	260	280	68	59	39	30	100	.....
18	.....	.....	590	336	280	252	89	98	45	30	89	.....
19	.....	.....	560	1,120	300	228	65	86	39	25	77	.....
20	.....	.....	668	775	296	188	54	77	44	26	77	.....
21	.....	.....	1,010	560	292	157	61	63	44	29	81	.....
22	2,500	.....	936	445	300	143	63	49	42	47	84	.....
23	1,580	.....	845	385	276	122	63	54	33	39	65	.....
24	915	.....	915	370	340	115	59	54	33	36	72	.....
25	656	.....	894	650	345	109	45	56	32	32	86	.....
26	530	.....	852	2,910	345	129	42	42	33	36	118	.....
27	530	.....	668	1,660	292	100	42	39	45	33	112	.....
28	445	1,010	692	992	268	109	49	36	45	30	81	.....
29	385	.....	626	845	252	109	42	38	42	32	122	.....
30	345	.....	560	880	216	86	45	45	32	42	115	.....
31	355	.....	572	.....	192	.....	45	42	.....	32	.....	.....

NOTE.—Daily discharge determined from a rating curve well defined below 1,000 second-feet. Discharge Jan. 22 and Mar. 2 to 8 estimated because of probable backwater from ice jams. The relation of gage height to discharge may also have been affected by ice at other times during January and February and the first of March.

Determinations of discharge Feb. 5 to 27, Mar. 2 to 8, and Dec. 4 to 10, as published in the 1910 New York State report, have been revised. Daily discharge Feb. 5 to 27 and Dec. 4 to 10 not published in Federal report, as it is only very approximate.

Monthly discharge of Mongaup River near Rio, N. Y., for 1910.

[Drainage area, 189 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	a 2,500	.....	306	1.62	1.87	C.
February	1,010	.....	240	1.27	1.32	C.
March	3,040	560	910	4.83	5.57	C.
April	2,910	240	611	3.23	3.60	A.
May	710	192	377	1.99	2.29	A.
June	435	86	218	1.15	1.28	A.
July	100	42	63	.333	.38	A.
August	202	36	61.5	.325	.37	A.
September	150	32	54.7	.289	.32	A.
October	49	25	32.5	.172	.20	A.
November	355	30	118	.624	.70	A.
December	.....	.....	150	.794	.92	D.
The year	3,040	25	262	1.39	18.82	

a Estimated.

NOTE.—Discharge for periods during which ice was present estimated by means of climatologic records and the discharge at other stations in the Delaware River basin.

Mean discharge Jan. 1 to 21 estimated 60 second-feet; practically constant.

Mean discharge Feb. 5 to 27 estimated 200 second-feet; slightly variable.

Mean discharge Dec. 3 to 31 estimated 156 second-feet; nearly constant.

Determinations of discharge for January to March and December in the above table are revisions of and supersede those published in the New York State report for 1910.

NEVERSINK RIVER AT GODEFFROY, N. Y.

Neversink River is formed by the confluence of its East and West branches, in the northern part of Sullivan County, and flows southward across Sullivan and Orange counties into Delaware River at Port Jervis.

Its principal tributaries are Sheldrake Creek, which comes in from the west through a chain of lakes and joins the river at Thompsonville, about 25 miles from the mouth; and Bush Kill, a small tributary from the same side, joining at Oakland Valley, some 12 miles farther downstream. From the east Basher Kill, a tributary of considerable importance, formed by Pine Kill and Gamauer Brook, flows into the Neversink near Godeffroy, about 9 miles from Port Jervis, and just above the gaging station which is located at the suspension highway bridge at this point.

The river drains a narrow valley along the southern slope of the Catskill Mountains. There are several reservoirs in the upper watershed, two of which are now in use. The principal power is located at Roses Point, near Cuddybackville, in the vicinity of the old Delaware & Hudson Canal. About half a mile above this point a low concrete dam diverts water through the old feeder ditch to the plant. This plant supplies Port Jervis, Middletown, and other small places in the vicinity with electric light and power.

The gaging station is located at the suspension highway bridge about half a mile east of the town of Godeffroy and 8 miles above the mouth of the river. A staff gage was established at this point August 4, 1903, and was washed out October 9 in the same year. The station was reestablished August 22, 1909, and is maintained in cooperation with the State engineer's department.

An enamel iron staff gage was bolted to the river face, downstream end of the left abutment. This gage was removed by a flood, January 21, 1910, and a chain gage was fastened to the left-hand downstream tower on August 1, 1910, at the same datum. This datum is 0.98 foot lower than that of the gage of 1903. The new gage datum has remained the same during the maintenance of the station. The area of the drainage basin above the station is 314 square miles; area above mouth is 346 square miles.

Measurements are made at the suspension bridge except at low stages, when they are made by wading. Conditions of flow are very unstable at this station, and hence the relation of gage height to discharge is liable to change at each flood stage. The daily gage heights are also affected by the controlling influence of power plants above the station. As a result it is impossible to obtain the correct mean daily gage heights, particularly at low stages, without the use of an automatic gage.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor, State of New York.

Discharge measurements of Neversink River at Godeffroy, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar 6	W. G. Hoyt	160	817	5.15	2,530
10	do	157	674	4.85	1,680
July 29[a]	do	117	109	2.85	81.8
Aug. 1	do	145	183	3.25	211

[a] Wading measurement below bridge.

LEHIGH RIVER AT SOUTH BETHLEHEM, PA.

Lehigh River at South Bethlehem, exclusive of Monocacy Creek, drains 1,235 square miles, and including Monocacy Creek at high stages drains 1,286 square miles of territory in nine counties of Pennsylvania. The river rises in the Pocono Mountains at an elevation of approximately 2,000 feet above sea level and its slope is steep throughout its course, falling in the lower 45 miles from Mauch Chunk to Easton, where it joins Delaware River, about 8 feet to the mile; for the 40 miles above Mauch Chunk the slope is about 24 feet to the mile. It is crossed between Easton and Mauch Chunk by nine dams of the Lehigh Coal & Navigation Co., erected to deflect the water into the Lehigh Canal.

The gaging station, which is located on the New Street Bridge, connecting Bethlehem and South Bethlehem, was established by the United States Geological Survey September 22, 1902, and was until February 13, 1905, under the supervision of Prof. Mansfield Merriam, of Lehigh University. On that date the station was discontinued, but was reestablished by the Water Supply Commission of Pennsylvania at the same point on April 26, 1909.

The present equipment consists of a standard chain-and-weight gage, similar to that previously employed, the new datum being 0.09 foot higher than the old. The elevation of the zero of the present gage is 210.64 feet above sea level.

The channel is straight for one-third mile above station and for several hundred feet below the station. A low rubble dam, built across a portion of the channel a few hundred feet below the bridge late in the fall of 1902, caused an alteration in the rating curve. Changes in this dam caused a further slight change in the rating curve between 1905 and 1909.

The left bank is low and is overflowed at high stages; the right bank is high and does not overflow. The river bed consists of sand, gravel, and bowlders and seems to be fairly permanent, with good velocity at low stages.

The relation between gage height and discharge is little affected by ice.

The Lehigh Canal follows the left bank and passes over Monocacy Creek and under the left span of the bridge; the creek also passes under the bridge, entering the river a short distance below. An ice plant and gristmill take water from the canal and return it to the river above the bridge. The canal is measured at Main Street Bridge, one-third mile above the station, and the discharge, reduced by the amount of tailrace flow of ice plant and gristmill, is added to the river discharge.

At high stages the river overflows into the canal and creek.

Excessive floods are known to have occurred on the Lehigh in 1862 and 1869, when the stage reached about 21.48 feet and 20.5 feet, respectively, as reported to the present datum. The discharges were approximately 66,000 and 62,000 second-feet, respectively, or 53.4 and 50.2 second-feet per square mile. On account of the congestion of industry between Allentown and the mouth, considerable damage has been done by floods on the Lehigh.

The station since its reestablishment has been operated by the Water Supply Commission of Pennsylvania, and many of the measurements have been made by students of Lehigh University, under the direction of the civil engineering department.

Complete data for this station are published in Water-Supply Paper 261.

Daily gage height, in feet, of Lehigh River at South Bethlehem, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.03	3.19	8.45	2.83	4.80	3.39	2.57	1.88	2.09	1.77	1.67	2.28
2	2.08	3.08	8.06	2.75	4.49	3.27	2.50	1.76	1.98	1.68	1.96	2.29
3	2.40	3.08	7.62	2.80	4.25	3.27	2.48	1.75	2.02	1.81	2.08	2.20
4	2.15	3.05	6.58	2.60	4.15	3.34	2.44	1.79	2.38	1.66	1.98	2.02
5	2.51	2.96	5.95	2.68	3.92	3.13	2.43	1.99	2.33	1.69	2.34	2.13
6	2.20	3.85	5.72	2.73	3.59	3.61	2.39	1.93	2.02	1.62	2.26	2.11
7	2.39	2.57	6.10	2.93	3.48	3.38	2.33	1.81	2.08	1.79	2.32	1.98
8	2.80	2.56	6.04	2.88	3.34	3.13	2.52	1.86	2.12	1.75	2.22	1.94
9	2.56	3.84	5.38	2.76	3.62	3.01	2.47	1.97	2.03	1.69	2.15	1.85
10	2.53	3.85	4.91	2.68	3.66	3.07	2.40	2.10	1.92	1.72	2.16	1.80

Daily gage height, in feet, of Lehigh River at South Bethlehem, Pa., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	2.40	2.70	4.91	2.64	3.46	3.27	2.65	2.32	1.83	1.65	2.05	1.79
12	2.31	2.54	4.36	2.60	3.33	3.41	2.46	2.19	1.97	1.63	2.39	1.85
13	2.31	2.50	4.07	2.52	3.20	3.36	2.28	2.02	1.89	1.65	2.27	2.03
14	2.29	2.54	3.84	2.53	3.08	3.13	2.10	1.94	2.45	1.57	2.34	1.93
15	2.15	2.62	3.81	2.48	2.96	2.98	2.15	2.04	2.42	1.41.	2.27	2.02
16	2.05	2.71	3.78	2.41	2.92	3.08	2.08	1.97	2.22	1.60	2.16	1.95
17	2.21	2.80	3.68	2.37	2.83	3.65	2.32	1.90	1.97	1.71	2.25	2.14
18	2.29	3.68	3.57	4.76	2.80	3.60	2.35	1.80	1.88	1.73	2.14	1.92
19	2.65	3.34	3.39	5.98	2.81	3.48	2.22	1.77	1.95	1.54	2.13	2.00
20	2.07	3.10	3.34	5.56	2.77	3.14	2.15	1.90	1.87	1.70	2.01	2.04
21	2.09	5.00	3.48	5.09	3.32	3.84	2.10	1.84	1.70	1.66	2.15	1.94
22	12.28	6.74	3.52	4.70	3.25	3.40	2.02	1.83	1.84	1.69	2.10	1.88
23	7.43	5.71	3.40	4.30	3.14	3.26	2.00	1.84	1.71	1.70	2.11	1.85
24	5.69	4.49	3.33	4.18	3.12	3.35	1.91	1.80	1.66	1.90	1.94	2.58
25	4.96	3.95	3.25	7.48	5.01	2.97	1.97	1.81	1.68	1.77	2.04	3.26
26	4.33	3.70	3.20	7.99	5.26	2.88	1.93	1.76	1.85	1.71	2.07	2.79
27	4.11	3.77	3.12	7.06	4.81	2.88	1.83	1.52	1.86	1.72	2.04	2.81
28	3.85	5.95	3.16	5.88	4.32	2.88	1.90	1.64	1.91	1.74	2.11	2.69
29	3.69	.....	3.07	5.17	4.00	2.80	1.86	1.81	1.82	1.62	2.17	2.75
30	3.43	.....	2.98	5.52	3.74	2.72	1.76	1.68	1.87	1.54	2.21	2.93
31	3.41	.....	2.86	.....	3.46	.....	1.88	1.63	.....	1.72	.....	3.12

NOTE.—Relation between gage height and discharge probably affected by ice from about Jan. 1 to 21.

Comparisons of gage heights at this station with those at other stations in the Delaware River basin indicate that the gage heights recorded for Feb. 6, 9, and 10 were 1 foot too high.

Water restored to the canal Mar. 14 and withdrawn Dec. 2.

Daily discharge, in second-feet, of Lehigh River at South Bethlehem, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,910	14,500	1,450	5,020	2,260	1,140	486	652	410	347	826
2	.....	1,750	13,400	1,350	4,320	2,070	1,060	404	560	353	545	836
3	.....	1,750	12,200	1,420	3,820	2,070	1,030	398	592	437	643	705
4	.....	1,700	9,370	1,170	3,620	2,180	989	424	925	341	560	547
5	.....	1,580	7,760	1,270	3,190	1,860	978	568	875	359	885	642
6	.....	1,440	7,180	1,330	2,600	2,630	935	522	592	317	807	624
7	.....	1,090	8,130	1,590	2,410	2,250	875	437	643	424	865	515
8	.....	1,080	7,980	1,520	2,180	1,860	1,080	472	678	398	769	485
9	.....	1,420	6,340	1,360	2,650	1,690	1,020	552	600	359	705	420
10	.....	1,440	5,220	1,270	2,720	1,780	945	660	515	378	714	385
11	.....	1,240	5,220	1,220	2,380	2,070	1,230	865	451	335	618	378
12	.....	1,060	4,000	1,170	2,170	2,300	1,010	741	552	323	935	420
13	.....	1,010	3,420	1,080	1,960	2,220	826	592	493	335	818	556
14	.....	1,060	3,040	1,090	1,790	1,860	660	530	1,000	288	885	478
15	.....	1,150	2,990	1,030	1,630	1,650	705	609	967	265	816	547
16	.....	1,270	2,930	956	1,570	1,790	643	552	769	305	714	492
17	.....	1,370	2,760	915	1,450	2,700	865	500	552	372	798	651
18	.....	2,710	2,560	4,920	1,420	2,620	895	430	486	384	696	470
19	.....	2,140	2,260	7,880	1,430	2,410	769	410	538	272	687	530
20	.....	1,780	2,180	6,820	1,380	1,880	705	500	479	365	584	564
21	.....	5,570	2,410	5,690	2,150	3,040	660	458	365	341	705	485
22	26,800	9,780	2,480	4,780	2,040	2,280	592	451	458	359	660	441
23	11,600	7,160	2,280	3,920	1,880	2,060	575	458	372	365	669	420
24	7,100	4,280	2,170	3,680	1,850	2,200	508	430	341	500	530	1,100
25	5,340	3,200	2,040	11,800	5,500	1,640	552	437	353	410	609	2,010
26	3,940	2,740	1,960	13,200	6,100	1,520	522	404	465	372	634	1,360
27	3,500	2,870	1,850	10,700	5,040	1,520	451	261	472	378	609	1,380
28	3,020	7,760	1,910	7,620	3,970	1,520	500	329	508	391	669	1,230
29	2,730	.....	1,780	5,880	3,340	1,420	472	437	444	317	723	1,310
30	2,280	.....	1,650	6,720	2,860	1,320	404	353	479	272	760	1,540
31	2,250	.....	1,490	.....	2,380	.....	486	323	.....	378	.....	1,800

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Discharge Feb. 6, 9, and 10 applied to the gage heights of the respective days after a reduction of 1 foot in the recorded gage height.

During the period Mar. 14 to Dec. 2, when the canal was in operation, 45 second-feet was added to the daily discharge.

Monthly discharge of Lehigh River at South Bethlehem, Pa., for 1910.

[Drainage area, 1,235 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	26,800	.....	2,650	2.15	2.48	B.
February	9,780	1,010	2,620	2.12	2.21	A.
March	14,500	1,490	4,690	3.80	4.38	A.
April	13,200	915	3,830	3.10	3.46	A.
May	6,100	1,380	2,800	2.27	2.62	A.
June	3,040	1,320	2,020	1.64	1.83	A.
July	1,230	404	777	.629	.73	A.
August	865	261	484	.392	.45	A.
September	1,000	341	573	.464	.52	A.
October	500	205	356	.288	.33	A.
November	935	347	699	.566	.63	A.
December	2,010	378	779	.631	.73	A.
The year	26,800	205	1,850	1.50	20.37	

NOTE.—Includes the flow of the canal.
Discharge for periods during which ice was present determined by means of climatologic records.
Mean discharge, Jan. 1 to 21, estimated 650 second-feet.

TOHICKON CREEK AT POINT PLEASANT, PA.

Tohickon Creek rises in the western part of Bucks County, Pa., and flows eastward into the Delaware at Point Pleasant. Its drainage area comprises about 102 square miles, the greater part being farm land under a high degree of cultivation, the original forest cover having been almost entirely cut away. The stream is subject to very sudden freshets, and during heavy rains large quantities of surface soil are eroded.

The gaging station is located about one-eighth mile above the mouth of the creek, and the records show the discharge of practically the entire drainage area. The fall of the stream from its source to the gaging station is about 600 feet in 28 miles. Continuous records of flow have been obtained each year since 1883, with the exception of 1900, by the Philadelphia bureau of water, department of public works, under the personal supervision of John E. Codman, by whom the following data have been furnished.

An automatic gage is used to obtain a continuous record of gage height. The lower part of the rating curve has been developed from the computed discharge over a weir, and the discharge at high stages is determined from a curve developed from current-meter measurements. The discharge rating curve is well defined.

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	10.6	95.0	3,064.0	20.1	216.5	20.7	11.6	2.3	204.5	4.3	11.2	37.3
2	9.0	73.6	2,367.0	19.2	103.0	18.1	10.6	1.9	193.0	4.4	7.6	32.6
3	9.0	63.5	1,520.0	19.8	75.5	17.0	7.0	2.1	267.5	3.7	10.5	32.6
4	8.4	63.5	875.0	19.8	85.5	18.8	8.6	2.4	490.5	6.9	967.2	30.6
5	7.3	61.8	354.0	24.8	78.3	16.3	10.3	2.6	317.5	3.9	1,518.5	30.6
6	20.7	60.6	279.0	27.9	57.1	17.8	8.3	2.9	82.5	3.1	374.5	33.0
7	412.0	60.6	392.0	24.6	43.8	25.0	8.2	5.3	226.0	3.4	135.5	33.0
8	866.0	60.6	260.0	23.1	39.5	18.5	8.2	3.4	108.5	6.6	73.8	33.0
9	1,089.5	60.6	145.0	23.1	49.0	20.0	6.5	15.2	53.0	4.1	54.6	33.0
10	1,113.0	60.6	107.5	17.6	55.6	28.7	4.2	33.5	36.8	4.8	42.8	30.6
11	956.5	107.3	87.7	19.5	48.6	115.8	3.6	458.0	26.2	9.3	37.0	23.8
12	788.5	154.0	72.6	21.8	39.7	1,123.5	5.2	125.5	21.0	2.4	30.4	20.0
13	669.0	136.0	65.5	19.8	35.0	531.5	4.3	48.5	20.4	5.4	28.2	21.4
14	643.0	102.5	66.1	17.1	29.2	149.5	4.3	32.1	16.3	2.9	32.7	19.8
15	649.5	73.5	60.5	13.3	22.7	91.0	3.6	27.9	12.6	3.8	32.7	17.6
16	596.5	88.0	52.6	10.6	21.3	79.0	3.6	18.8	29.5	4.3	34.6	14.5
17	571.0	461.5	47.1	10.6	22.0	166.5	3.3	13.7	18.3	3.1	28.4	13.3
18	599.5	685.5	43.0	827.8	23.1	389.0	2.9	23.7	9.4	3.9	21.9	11.3
19	1,441.5	586.5	43.5	687.2	24.5	151.0	3.1	14.5	16.1	10.3	22.3	9.7
20	1,620.0	360.0	44.5	416.0	28.3	79.0	3.4	12.2	14.0	11.1	22.3	9.0
21	1,882.2	1,623.5	49.5	212.0	30.6	48.5	3.3	9.8	15.2	6.3	19.7	8.4
22	3,369.3	2,607.0	50.9	140.0	44.3	31.0	2.9	10.9	12.9	12.8	21.1	7.8
23	1,664.0	1,498.5	43.3	94.7	55.6	26.3	2.3	14.5	8.4	10.2	23.5	7.8
24	594.5	849.0	30.5	1,948.1	46.0	23.7	2.3	10.6	8.5	10.1	19.3	782.0
25	246.5	270.5	25.0	3,549.5	165.5	73.9	2.6	9.5	10.3	13.1	16.1	734.0
26	160.0	201.0	23.9	1,939.0	188.5	126.0	2.4	10.6	4.8	16.9	13.0	294.0
27	140.5	541.0	25.8	515.0	116.6	71.3	3.6	6.3	8.6	14.5	8.9	145.5
28	114.0	2,306.5	26.8	198.5	52.6	18.1	4.0	3.6	8.9	13.3	11.2	90.5
29	107.0	.....	26.4	136.5	37.0	15.7	2.8	4.4	4.6	11.7	22.6	74.0
30	107.0	.....	25.4	345.0	31.8	14.1	2.6	7.6	3.6	6.4	36.9	302.5
31	107.0	.....	21.6	.....	25.2	.....	2.6	4.0	.....	5.3	.....	225.0

Monthly discharge of Tohickon Creek at Point Pleasant Pa., for 1910.

[Drainage area, 102 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	3,369.3	7.3	664	6.51	7.50
February	2,607.0	60.6	475	4.66	4.85
March	3,064.0	21.6	332	3.25	3.75
April	3,549.5	10.6	378	3.71	4.14
May	216.5	21.3	61.0	.598	.69
June	1,123.5	14.1	117	1.15	1.28
July	11.6	2.3	4.91	.048	.05
August	458.0	1.9	30.3	.297	.34
September	490.5	3.6	75.0	.735	.82
October	16.9	2.4	71.7	.703	.81
November	1,518.5	7.6	123	1.21	1.35
December	782.0	9.0	102	1.00	1.15
The year	3,369.3	1.9	195	1.91	26.73

NESHAMINY CREEK BELOW FORKS, PENNSYLVANIA.

Neshaminy Creek rises in the eastern part of Montgomery County, Pa., flows in a southeasterly and southerly course, and enters Delaware River at a point about 12 miles above Philadelphia. The drainage area, measured at the forks of the Big and Little Neshaminy, is 139 square miles, mostly farm land in a high state of cultivation, the

original forest growth having been almost entirely cut away. The stream is subject to very sudden freshets, and during heavy rains large quantities of surface soil are eroded.

Continuous records of discharge have been obtained since 1884 by the Philadelphia bureau of water, department of public works, under the personal supervision of John E. Codman, by whom the records have been furnished. The station is located a short distance below the junction of Big and Little Neshaminy creeks, and the discharge represents about one-half of the total drainage area of the stream. The fall of the stream from its source to the gaging station is about 600 feet in 27 miles.

An automatic gage is used to obtain a continuous record of gage height. The lower part of the rating curve has been developed from the computed discharge over a weir, and the discharge at high stages is determined from a curve developed from current-meter measurements. The discharge rating curve is well defined.

Daily discharge, in second-feet, of Neshaminy Creek below forks, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	93.0	129.5	3,539.0	43.5	415.0	41.0	28.5	7.9	50.0	7.2	8.4	42.0
2	105.0	129.5	883.0	44.0	345.5	33.5	27.0	7.4	167.5	7.7	10.0	37.5
3	105.0	183.5	552.0	44.5	156.0	35.0	38.0	8.2	70.0	7.5	88.2	35.5
4	105.0	213.0	358.0	54.0	151.0	37.5	36.0	25.0	55.0	6.7	1,070.5	40.0
5	105.0	179.5	295.0	64.0	134.5	36.5	28.0	50.5	47.5	6.8	627.0	41.0
6	157.5	126.5	287.0	56.0	119.0	41.5	25.7	55.5	38.0	6.9	185.0	36.0
7	1,039.6	107.0	419.5	45.5	106.5	43.0	13.7	18.5	58.0	8.3	106.5	33.5
8	896.0	97.5	300.5	39.5	110.5	35.0	13.0	32.0	55.0	8.5	80.0	31.0
9	684.0	88.0	188.5	36.5	119.0	35.0	15.5	170.0	28.7	8.5	69.0	31.0
10	455.0	150.5	159.0	34.5	105.5	325.5	13.2	611.5	20.7	8.5	60.0	31.0
11	321.5	213.0	144.0	32.5	91.0	217.5	11.2	823.5	19.0	9.2	54.0	36.0
12	214.0	256.5	134.0	26.0	85.5	1,464.2	11.7	88.5	19.0	9.2	48.5	41.0
13	215.0	290.0	126.5	29.0	77.5	729.5	12.7	39.5	16.5	8.7	40.5	43.5
14	197.5	222.0	121.0	31.0	68.0	417.5	12.0	28.5	14.3	8.7	36.5	43.5
15	197.5	153.0	108.5	31.0	59.0	144.5	12.2	24.0	13.5	8.1	35.5	41.0
16	188.0	375.2	97.5	27.5	52.0	134.5	12.7	21.0	11.3	8.1	39.5	41.0
17	323.0	1,215.2	87.0	40.0	50.0	144.0	12.7	18.5	11.0	7.9	37.0	41.0
18	538.5	499.0	83.5	938.5	56.0	124.5	12.7	19.0	11.2	7.5	33.5	41.0
19	2,519.5	272.5	87.5	488.5	58.0	103.5	17.5	19.0	10.2	23.3	29.5	64.0
20	2,706.5	280.0	83.0	393.5	53.0	90.5	17.0	20.5	9.5	244.5	33.5	85.5
21	3,296.5	2,032.2	83.0	187.5	67.5	71.5	13.2	16.2	9.5	80.0	28.0	85.0
22	1,735.5	2,149.3	82.0	129.5	73.5	58.5	13.5	10.7	10.0	36.0	25.5	88.0
23	474.5	1,392.5	74.5	109.0	56.5	49.5	12.2	16.5	9.2	35.0	26.0	84.5
24	334.0	720.5	72.0	1,901.1	48.5	41.5	11.7	13.0	7.8	29.5	24.0	740.0
25	267.5	199.5	69.0	1,870.0	88.5	36.5	12.5	13.5	7.8	20.5	24.5	705.0
26	227.5	166.0	61.0	2,012.5	301.5	32.0	11.2	13.7	8.5	12.5	24.7	286.5
27	200.5	299.5	53.0	490.5	109.0	33.5	10.0	14.0	7.9	14.5	20.1	193.5
28	191.5	1,673.6	50.0	307.1	58.5	36.0	7.9	12.2	8.1	16.5	22.0	164.0
29	175.0	.....	48.0	264.0	44.0	33.5	7.2	11.7	7.7	10.8	38.0	134.5
30	175.0	.....	45.0	358.0	42.0	31.0	9.2	12.5	7.3	8.3	48.0	159.0
31	164.5	.....	44.0	.....	43.0	.....	9.2	13.5	.....	8.2	.....	258.0

Monthly discharge of Neshaminy Creek below forks, Pa., for 1910.

[Drainage area, 139 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	3,296.5	93.0	594	4.27	4.92
February	2,149.3	88.0	493	3.55	3.70
March	3,539.0	44.0	282	2.03	2.34
April	2,012.5	26.0	338	2.43	2.71
May	415.0	42.0	108	.777	.90
June	1,464.2	31.0	155	1.12	1.25
July	38.0	7.2	15.8	.114	.13
August	823.5	7.4	72.1	.519	.60
September	167.5	7.3	27.0	.194	.22
October	244.5	6.7	22.1	.159	.18
November	1,070.5	8.4	99.1	.713	.80
December	740.0	31.0	120	.864	1.00
The year	3,539.0	6.7	1,920	1.38	18.75

SCHUYLKILL RIVER NEAR PHILADELPHIA, PA.

Schuylkill River rises in the central part of Schuylkill County, Pa., flows southeastward, and unites with the Delaware at Philadelphia. Its length is about 100 miles and its drainage area measures about 1,920 square miles. The headwaters of the river lie in a mountainous, coal-bearing region, but 25 or 30 miles below its source it enters a more highly cultivated country and the slope becomes more gentle. There are no lakes in the basin, but there are three artificial reservoirs (Silver Creek and Lower and Upper Tumbling Run reservoirs) constructed for the benefit of navigation. The flow of the river is tolerably constant, but the freshets, notwithstanding the considerable storage, are severe. The Schuylkill is navigable for ocean-going vessels only as far as Fairmount, 8.4 miles from the mouth, where the first dam is built across the river. Above that point it is navigable for river boats as far as Schuylkill Haven.

With the exception of a small amount of water drawn from the Delaware, the entire water supply for the city of Philadelphia comes from the Schuylkill. The river receives a large amount of pollution from various sources, and a filtering plant for the city has been nearly completed.

Records of the height of the river at Fairmount Pool have been kept for many years, but not in such form as to be useful for the computation of daily discharges. Begining with 1898, however, careful estimates have been prepared by the Philadelphia bureau of water, department of public works, under the personal supervision of John E. Codman, by whom the records have been furnished. The station is located at the Fairmount dam near Philadelphia.

The computed daily discharge represents the total flow of the river as determined from the amount wasted over the flashboards at the Fairmount dam, the pumpage from the river, the leakage, and the quantity used for power at Fairmount.

Daily discharge, in second-feet, of Schuylkill River near Philadelphia, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	266	1,154	23,627	731	2,958	2,193	1,336	215	215	381	202	378
2	235	942	17,112	731	2,268	1,373	1,700	215	1,008	205	202	378
3	250	1,142	11,772	731	1,818	865	1,619	215	1,565	205	221	378
4	250	1,324	9,262	676	1,568	1,351	1,373	282	1,654	205	1,461	378
5	387	1,144	7,477	676	1,424	1,721	1,285	282	1,822	205	7,513	378
6	387	632	6,447	437	1,191	1,381	1,106	282	1,573	205	2,197	378
7	542	434	5,926	437	1,058	1,818	705	282	1,484	205	1,326	378
8	747	373	4,892	676	1,123	1,306	597	330	1,484	205	902	378
9	830	346	4,067	676	1,193	1,217	453	664	1,179	205	615	378
10	645	542	3,261	567	1,348	1,448	488	1,091	796	205	503	378
11	465	542	2,506	507	1,348	1,450	571	2,491	558	205	461	295
12	387	351	2,506	507	1,193	2,710	571	868	558	205	294	295
13	266	351	2,506	487	1,128	4,073	482	474	558	205	202	295
14	266	434	2,101	701	988	2,240	482	282	558	205	294	295
15	235	484	1,741	413	918	1,781	398	282	558	205	331	295
16	240	1,154	1,706	389	673	2,079	398	282	474	205	331	295
17	327	1,949	1,541	511	673	5,184	399	474	390	205	260	378
18	327	5,427	1,456	642	673	5,694	565	390	390	205	294	378
19	646	5,188	1,386	7,662	526	6,834	795	1,484	390	205	294	203
20	1,035	2,994	1,241	4,752	620	6,574	470	857	237	334	288	228
21	4,249	4,948	1,241	6,927	688	4,385	353	410	215	288	294	286
22	36,607	20,670	1,241	4,711	1,263	3,024	353	390	215	349	350	286
23	21,671	17,485	1,471	3,727	1,508	2,380	353	215	215	349	294	286
24	8,099	7,570	1,316	3,491	1,068	2,177	336	215	215	464	294	682
25	4,560	3,986	1,241	12,688	848	1,734	215	215	215	405	329	625
26	3,263	2,619	1,166	11,272	8,559	1,254	215	215	538	320	329	682
27	2,314	2,314	1,166	6,957	6,314	1,094	215	215	840	205	285	1,181
28	1,959	13,420	1,166	4,604	4,098	840	215	215	731	297	285	570
29	1,799	.....	1,106	3,291	2,958	840	215	215	558	205	294	514
30	1,454	.....	1,106	3,091	2,178	904	215	215	428	205	427	1,047
31	1,314	.....	1,054	.....	1,658	.....	215	215	.....	205	.....	1,549

NOTE.—Records that show no variation for several consecutive days were computed by periods and the discharge distributed uniformly through the days of each period. The variation during these periods was relatively small.

Monthly discharge of Schuylkill River near Philadelphia, Pa., for 1910

[Drainage area, 1,920 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	36,607	235	3,100	1.62	1.87
February	20,670	346	3,570	1.86	1.94
March	23,627	1,054	4,060	2.11	2.43
April	12,688	389	2,790	1.45	1.62
May	8,559	526	1,800	.938	1.08
June	6,834	840	2,400	1.25	1.40
July	1,700	215	603	.314	.36
August	2,491	215	467	.243	.28
September	1,822	215	721	.376	.42
October	464	205	248	.129	.15
November	7,513	202	712	.371	.41
December	1,549	203	466	.243	.28
The year	36,607	202	1,730	.901	12.24

PERKIOMEN CREEK NEAR FREDERICK, PA.

Perkiomen Creek rises in the western part of Bucks County, Pa., flows southward, and discharges into the Schuylkill about 7 miles above Norristown and 18 miles above Philadelphia. Its drainage area comprises about 345 square miles. The area is mostly in farm land under a high state of cultivation, the original forest growth having been almost entirely cut away. The stream is subject to very sudden freshets, and during heavy rains large quantities of surface soil are eroded.

Continuous records of discharge have been obtained since 1884 by the Philadelphia bureau of water, department of public works, under the personal supervision of John E. Codman, by whom the following records have been furnished. The station is located about 12 miles above the mouth of the creek and above the East Branch, and the discharge represents about one-third of the total area drained by the stream. The fall of the creek from its source to the gaging station is about 800 feet in 24 miles.

An automatic gage is used to obtain a continuous record of gage height. The lower part of the rating curve has been developed from the computed discharge over a weir, and the discharge at high stages is determined from a curve developed from current-meter measurements. The discharge rating curve is well defined.

Daily discharge, in second-feet, of Perkiomen Creek near Frederick, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	56.5	130.5	2,498.6	61.6	248.0	67.5	30.6	18.0	128.0	16.8	25.3	80.0
2	59.0	103.0	1,248.2	50.6	167.0	62.4	45.8	24.6	264.5	15.3	16.8	60.0
3	72.5	107.0	728.2	51.9	146.0	54.3	44.7	18.4	140.5	15.0	33.5	51.1
4	68.2	119.5	615.5	49.4	156.0	48.8	42.7	17.6	152.0	16.5	663.3	44.9
5	55.7	128.0	507.0	64.0	154.0	47.4	41.7	96.0	144.0	18.9	967.3	43.7
6	62.0	128.0	403.0	77.5	124.5	75.3	39.6	109.0	102.0	27.4	379.0	48.2
7	257.5	97.5	454.0	88.0	101.5	91.5	37.0	55.1	203.0	27.4	195.0	48.2
8	419.5	70.5	360.5	92.5	82.0	77.5	36.0	63.6	115.0	17.9	138.0	48.2
9	333.5	103.5	264.0	72.5	135.0	61.6	27.0	294.0	81.0	15.3	107.0	51.9
10	242.5	134.5	216.5	67.5	155.0	62.6	21.5	317.5	59.7	25.1	85.5	49.5
11	184.0	165.0	182.0	51.9	130.0	165.0	38.2	461.6	44.5	30.9	71.0	44.8
12	147.0	231.0	168.0	47.6	97.5	492.0	34.7	285.0	34.3	21.9	67.0	43.7
13	130.0	90.0	155.0	47.1	73.5	453.5	54.8	75.0	23.3	18.8	61.3	48.4
14	140.0	144.0	155.0	50.7	84.5	211.5	40.4	50.8	52.3	23.3	63.8	53.1
15	153.0	67.5	137.0	56.3	90.5	141.0	20.6	42.1	40.1	23.3	69.5	53.1
16	146.0	99.5	114.5	56.6	71.5	303.5	19.0	49.3	35.2	18.8	65.5	53.1
17	139.0	355.5	111.5	45.5	100.0	974.6	26.5	58.1	31.8	21.1	59.1	51.9
18	310.5	1,621.5	118.0	1,667.2	73.5	528.5	25.8	54.9	31.8	24.6	50.5	49.5
19	583.3	643.5	114.5	666.5	74.0	474.5	10.5	48.8	28.6	25.3	43.2	41.9
20	624.0	351.0	108.0	450.5	85.0	229.5	31.7	48.8	29.5	30.9	43.2	55.3
21	1,330.5	2,257.6	129.0	293.5	145.0	163.5	43.2	42.3	34.2	51.4	44.7	70.5
22	4,590.7	3,454.0	129.0	244.5	206.0	129.0	29.1	39.2	30.9	67.0	42.2	61.4
23	1,009.0	1,365.3	111.0	179.5	142.0	101.5	17.6	36.0	30.9	62.5	42.2	57.4
24	476.5	545.5	102.5	366.5	115.5	79.5	16.5	20.8	25.8	58.0	42.7	568.7
25	307.5	357.0	85.5	1,346.5	95.5	69.5	16.9	23.1	16.1	51.9	39.6	647.5
26	226.5	288.5	76.0	688.0	136.0	52.3	25.1	26.4	25.7	45.8	39.1	283.5
27	193.0	540.2	58.8	358.0	106.0	39.3	22.5	22.0	32.7	41.1	40.1	161.0
28	177.0	2,111.6	49.1	233.0	101.5	43.7	17.6	16.8	23.8	42.2	40.1	113.5
29	170.0	.....	55.0	198.0	73.0	49.8	17.9	23.6	17.6	37.2	64.8	107.0
30	116.0	.....	64.7	379.6	67.0	46.7	9.6	30.9	26.5	24.5	100.7	314.6
31	158.0	.....	75.0	.....	67.0	.....	5.7	26.3	.....	28.7	.....	264.2

Monthly discharge of Perkiomen Creek near Frederick, Pa., for 1910.

[Drainage area, 152 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	4,590.7	55.7	417	2.73	3.15
February	3,454.0	67.5	565	3.72	3.87
March	2,498.6	49.1	310	2.04	2.35
April	1,667.2	45.5	270	1.78	1.99
May	248.0	67.0	116	.763	.88
June	974.6	43.7	180	1.18	1.32
July	54.8	5.7	28.7	.189	.22
August	461.6	16.8	80.5	.530	.61
September	264.5	16.1	66.8	.439	.49
October	67.0	15.0	30.5	.201	.23
Novemebr	967.3	16.8	123	.809	.90
December	647.5	41.9	118	.776	.89
The year	4,590.7	5.7	189	1.24	16.90

WISSAHICKON CREEK NEAR PHILADELPHIA, PA.

Wissahickon Creek is the principal stream draining into Schuylkill River from the north below Perkiomen Creek. The following records which were inadvertently omitted from previous reports were furnished by John E. Codman:

Daily discharge, in second-feet, of Wissahickon Creek near Philadelphia, Pa., for 1902 and 1903.

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1902.			1902.			1902.		
1	82	110	11	68	96	21	31	362
2	73	120	12	66	120	22	31	1,032
3	68	338	13	64	130	23	26	320
4	68	135	14	75	84	24	33	202
5	68	140	15	66	108	25	84	162
6	80	149	16	45	2,495	26	140	150
7	101	111	17	45	675	27	132	177
8	85	103	18	38	253	28	96	166
9	64	96	19	27	206	29	71	133
10	66	87	20	27	186	30	71	133
						31	.....	137

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1903.										
1	128	140	340	193	140	73	56	10	20	12
2	140	137	211	168	132	68	46	10	19	14
3	1,241	130	188	158	123	56	92	13	17	14
4	269	510	174	248	132	46	113	28	17	11
5	184	337	168	215	140	54	66	49	23	13
6	198	122	164	157	132	64	35	43	50	.....
7	185	150	160	211	123	64	45	44	47	.....
8	142	192	214	386	114	75	41	44	24	.....
9	137	191	275	590	106	71	19	32	18	.....
10	140	136	250	204	106	55	19	32	20	.....
11	218	197	209	182	106	59	18	23	19	.....
12	233	227	193	193	106	59	18	24	18	.....
13	98	159	182	193	106	59	87	24	16	.....
14	125	150	166	751	106	64	95	34	15	.....
15	111	184	157	833	106	64	54	52	15	.....

Daily discharge, in second-feet, of Wissahickon Creek near Philadelphia, Pa., for 1902 and 1903—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1903.										
16	115	289	152	434	103	70	19	38	30	.....
17	118	258	147	300	99	66	16	20	66	.....
18	118	137	147	255	103	45	374	14	66	.....
19	108	132	135	230	94	45	296	17	24	.....
20	103	135	128	216	84	110	103	17	18	.....
21	820	123	166	200	87	140	87	16	15	.....
22	214	123	347	182	80	85	105	15	16	.....
23	214	123	554	166	73	64	114	13	16	.....
24	158	133	340	158	73	75	85	13	15	.....
25	114	148	202	158	73	75	54	16	15	.....
26	113	164	174	156	73	57	33	16	15	.....
27	115	161	168	156	68	49	20	15	27	.....
28	716	1,103	162	149	64	47	15	53	22	.....
29	303	.....	157	140	78	77	12	68	17	.....
30	158	.....	208	140	87	85	10	35	14	.....
31	144	.....	425	.....	78	.....	10	22	.....	.....

Monthly discharge of Wissahickon Creek near Philadelphia, Pa., for 1902 and 1903.

[Drainage area, 65 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1902.					
November	140	26	66.4	1.02	1.14
December	2,495	84	281	4.32	4.98
1903.					
January	1,241	98	232	3.57	4.12
February	1,103	122	214	3.29	3.43
March	554	128	215	3.31	3.82
April	833	140	257	3.95	4.41
May	140	64	100	1.54	1.78
June	140	45	67.4	1.04	1.16
July	374	10	69.6	1.07	1.23
August	68	10	27.4	.422	.49
September	66	14	24.0	.369	.41

SUSQUEHANNA RIVER.

GENERAL FEATURES OF AREA DRAINED.

Susquehanna River rises in Otsego Lake, in northern Otsego County, N. Y., at an elevation of 1,193 feet above tide, and flows in a general southerly direction into Chesapeake Bay. Its course is in many places extremely tortuous, crossing the State boundary between New York and Pennsylvania three times. The entire length of the river is about 500 miles, and it drains an area of 27,400 square miles, of which 21,060 square miles lie in Pennsylvania, 6,080 in New York, and 260 in Maryland.

The topography of the basin varies widely in character. In New York the stream and its tributaries flow through a rolling and in places rather broken country, bounded on the north by a moun-

tainous area. In this part of its course its bed is of gravel or sand, with rock ledges here and there, and its banks are moderately high and not extensively subject to overflow. In Pennsylvania the river enters a mountain region, its banks are high, and it winds and twists among the parallel ranges in a bed composed generally of drift materials, gravels, sand, and bowlders. In the lower part of its course, from Marietta to Havre de Grace, it occupies a broad, deep valley, ranging in width from a few hundred feet to more than a mile, and is for the most part bounded on either shore by rocky bluffs and table-lands elevated from 100 to 500 feet above its waters.

Above the mouth of the West Branch the fall of the stream is uniform and gradual; below that point the fall becomes more irregular, and there are at many places rapids where the stream flows over a rocky bottom. The elevation of the river at the mouth of the West Branch is 400 feet above mean sea level at Havre de Grace, the distance between the two points being 125 miles. The slope is, however, extremely variable.

The fall in the lower part of the river offers exceptional opportunities for power developments, the value of which is greatly enhanced by their proximity to an unlimited market in the adjacent large cities. The hydrographic investigations of the Geological Survey along Susquehanna River have been of great assistance to engineers in investigating these powers.

In early days a complete system of canals was built along the river from the New York State line to the bay, but these have been abandoned with the establishment of railroads. The head of navigation is at the fall line, near the mouth of the stream, but various stretches are navigable for flatboats.

All available hydrographic data for the Susquehanna River basin prior to 1905 have been collected and published in Water-Supply Papers 108 and 109. No. 108 treats principally of the quality of the water, and No. 109 gives in detail information relative to fluctuations in stage and quantity of water flowing.

SUSQUEHANNA RIVER AT BINGHAMTON, N. Y.

This station, which is located on the Washington Street Bridge at Binghamton, was established July 31, 1901, and has since been maintained in cooperation with the New York State engineer department.

No important tributary enters Susquehanna River between the gaging station and the mouth of Unadilla River, about 50 miles upstream. Chenango River enters about 800 feet downstream, and causes backwater at high stages.

The Binghamton water-power dam, a timber structure affording 6-foot head, is situated 2,800 feet upstream from the bridge. This dam exerts no material control over the flow.

The datum of the chain gage attached to the Washington Street Bridge has remained the same during the maintenance of the station.

On account of the unfavorable conditions at the Washington Street Bridge discharge measurements have usually been made at the Exchange Street Bridge, 1,900 feet upstream.

During the winter months the discharge is usually more or less affected by ice.

The rating curve for low and medium stages is not satisfactory, apparently because of changes in the conditions of flow. Backwater, caused by ice jams which form near Willow Point and also by high water in the Chenango, considerably impairs the accuracy of high-water gage heights.

Information in regard to this station is contained in the reports of the State engineer and surveyor, State of New York.

Discharge measurements of Susquehanna River at Binghamton, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 8[a]	W. G. Hoyt	389	4,340	11.55	24,700
May 7[b]	C. C. Covert	421	993	3.32	3,750
July 26[c]	W. G. Hoyt	312	343	1.95	545

[a] Surface float measurement made by timing floating ice and débris from Exchange Street Bridge.
[b] Measurement made from Washington Street Bridge.
[c] Measurement made partly from Washington Street Bridge and partly by wading.

Daily gage height, in feet, of Susquehanna River at Binghamton, N. Y., for 1910.

[Hugh L. Smith, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.2	3.15	14.95	3.85	3.5	3.55	2.4	1.75	1.8	2.1	1.9	2.5
2	2.1	3.0	17.65	3.6	3.5	3.7	2.35	1.9	1.8	2.1	1.95	2.5
3	2.1	3.0	15.45	3.4	3.6	3.65	2.3	1.8	1.88	2.0	1.9	2.45
4	2.05	3.0	13.4	3.2	4.55	3.3	2.3	1.75	1.8	2.0	1.9	2.4
5	2.45	2.8	10.6	3.15	4.0	3.1	2.2	1.8	1.85	2.0	2.0	2.4
6	2.2	3.0	10.2	3.05	3.7	3.25	2.2	1.8	1.9	1.95	2.0	2.3
7	2.6	2.5	12.25	3.0	3.2	4.4	2.15	1.75	2.2	2.05	2.0	2.15
8	2.75	2.5	11.2	3.0	3.1	4.9	2.15	1.7	2.05	2.05	2.2	2.3
9	2.65	2.5	9.1	3.1	3.1	4.3	2.2	1.75	2.0	1.95	2.2	2.28
10	2.6	2.8	7.22	2.9	3.15	3.8	2.1	1.8	2.0	2.05	2.2	2.1
11	2.45	2.65	6.2	2.9	3.1	3.65	2.1	1.9	1.85	2.0	3.0	2.2
12	2.35	2.6	5.6	2.9	3.0	4.5	2.15	1.85	1.9	1.95	2.85	2.2
13	2.4	2.6	5.6	3.3	2.85	4.5	2.0	1.85	1.95	1.8	2.8	2.2
14	2.4	2.4	5.4	3.1	2.75	4.05	1.95	1.8	1.95	1.8	2.65	.....
15	2.3	2.55	4.95	2.9	2.7	3.55	1.95	1.8	1.9	1.9	2.55	.....
16	2.3	2.55	4.6	2.7	2.6	3.3	2.0	1.8	1.9	1.7	2.6	.....
17	2.35	2.6	4.25	2.6	2.55	3.35	2.0	1.85	1.85	1.9	2.5	2.2
18	2.3	2.75	4.0	2.65	2.5	3.3	2.0	1.85	1.8	1.88	2.45	2.3
19	2.6	2.7	3.8	2.8	2.5	4.3	1.95	1.8	1.95	1.85	2.4	2.2
20	3.2	2.8	4.1	3.35	2.5	3.85	1.95	1.85	1.9	1.9	2.4	2.2
21	3.6	2.8	5.65	3.15	2.5	3.5	1.9	1.75	1.95	1.85	2.4	2.15
22	9.0	3.7	5.8	3.0	2.4	3.05	2.0	1.7	1.85	1.85	2.25	2.22
23	9.1	4.1	5.55	2.9	2.5	2.85	1.9	1.8	1.85	1.7	2.3	2.2
24	7.7	3.9	5.7	2.9	2.4	2.7	1.85	1.8	1.9	1.9	2.35	2.25
25	6.0	3.4	5.9	3.25	2.55	2.65	1.9	1.8	1.7	1.85	2.5	2.6
26	4.95	3.55	6.35	3.25	6.5	2.6	1.9	1.75	1.85	1.9	2.6	2.75
27	4.25	3.2	5.9	4.1	5.7	2.5	1.95	1.8	1.85	1.85	2.55	2.65
28	4.0	9.75	5.1	4.1	4.9	2.55	1.9	1.75	1.95	1.9	2.5	2.55
29	3.75	.....	4.5	3.6	4.1	2.5	1.9	1.7	1.75	1.8	2.5	2.75
30	3.1	.....	4.3	3.65	3.55	2.5	1.9	1.8	1.9	1.65	2.5	4.4
31	3.15	.....	4.0	.....	3.5	.....	1.85	1.75	.....	1.9	.....	5.1

NOTE.—Relation of gage height to discharge probably affected by ice from Jan. 1 to 21, Feb. 10 to 27, and Dec. 8 to 31. Gage readings to water surface.

Daily discharge, in second-feet, of Susquehanna River at Binghamton, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3,440	43,400	5,210	4,320	4,440	1,610	272	335	920	500	1,850
2	.....	3,070	54,100	4,570	4,320	4,820	1,500	500	335	920	600	1,850
3	.....	3,070	45,400	4,070	4,570	4,700	1,380	335	467	700	500	1,730
4	.....	3,070	37,400	3,570	7,060	3,820	1,380	272	335	700	500	1,610
5	.....	2,570	27,300	3,440	5,600	3,320	1,150	335	418	700	700	1,610
6	.....	3,070	25,800	3,200	4,820	3,700	1,150	335	500	600	700	1,380
7	.....	1,850	33,200	3,070	3,570	6,650	1,040	272	1,150	810	700	1,040
8	.....	1,850	29,400	3,070	3,320	8,000	1,040	210	810	810	1,150	.....
9	.....	1,850	21,900	3,320	3,320	6,380	1,150	272	700	600	1,150	.....
10	.....	.....	15,300	2,820	3,440	5,080	920	335	700	810	1,150	.....
11	.....	.....	12,000	2,820	3,320	4,700	920	500	418	700	3,070	.....
12	.....	.....	10,100	2,820	3,070	6,920	1,040	418	500	600	2,700	.....
13	.....	.....	10,100	3,820	2,700	6,920	700	418	600	335	2,570	.....
14	.....	.....	9,500	3,320	2,450	5,730	600	335	600	335	2,210	.....
15	.....	.....	8,140	2,820	2,330	4,440	600	335	500	500	1,970	.....
16	.....	.....	7,190	2,330	2,090	3,820	700	335	500	210	2,090	.....
17	.....	.....	6,250	2,090	1,970	3,940	700	418	418	500	1,850	.....
18	.....	.....	5,600	2,210	1,850	3,820	700	418	335	467	1,730	.....
19	.....	.....	5,080	2,570	1,850	6,380	600	335	600	418	1,610	.....
20	.....	.....	5,860	3,940	1,850	5,210	600	418	500	500	1,610	.....
21	.....	.....	10,300	3,440	1,850	4,320	500	272	600	418	1,610	.....
22	21,500	.....	10,800	3,070	1,610	3,200	700	210	418	418	1,260	.....
23	21,900	.....	10,000	2,820	1,850	2,700	500	335	418	210	1,380	.....
24	16,900	.....	10,400	2,820	1,610	2,330	418	335	500	500	1,500	.....
25	11,400	.....	11,100	3,700	1,970	2,210	500	335	210	418	1,850	.....
26	8,140	.....	12,500	3,700	13,000	2,090	500	272	418	500	2,090	.....
27	6,250	.....	11,100	5,860	10,400	1,850	600	335	418	418	1,970	.....
28	5,600	24,200	8,580	5,860	8,000	1,970	500	272	600	500	1,850	.....
29	4,950	.....	6,920	4,570	5,860	1,850	500	210	272	335	1,850	.....
30	3,320	.....	6,380	4,700	4,440	1,850	500	335	500	162	1,850	.....
31	3,440	.....	5,600	.....	4,320	.....	418	272	.....	500	.....	.....

NOTE.—Daily discharge determined from a rating curve somewhat poorly defined.

Monthly discharge of Susquehanna River at Binghamton, N. Y., for 1910.

[Drainage area, 2,400 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	21,900	.....	3,760	1.57	1.81	D.
February	24,200	.....	2,490	1.04	1.08	D.
March	5,410	5,080	16,700	6.96	8.02	B.
April	5,860	2,090	3,520	1.47	1.64	B.
May	13,000	1,610	3,960	1.65	1.90	B.
June	8,000	1,850	4,240	1.77	1.98	B.
July	1,610	418	810	.338	.39	C.
August	500	210	331	.138	.16	C.
September	1,150	210	502	.209	.23	C.
October	920	162	533	.222	.26	C.
November	3,070	500	1,540	.642	.72	C.
December	.....	.....	899	.375	.43	D.
The year	24,200	162	3,360	1.40	18.62	

NOTE.—Discharge for periods during which ice was present estimated by means of climatologic records and the records of discharge at Wilkes-Barre.

Mean discharge Jan. 1 to 21 estimated about 600 second-feet; no great variation in discharge.

Mean discharge Feb. 10 to 27 estimated 1,200 second-feet, ranging from about 800 second-feet to about 3,000 second-feet.

Mean discharge Dec. 8 to 31 estimated 700 second-feet; no great variation in discharge.

Determinations of discharge for January, February, and December, published in the report of the New York State engineer and surveyor for 1910 have been revised.

SUSQUEHANNA RIVER AT WILKES-BARRE, PA.

This station is located at the Market Street Bridge, Wilkes-Barre. No important tributaries enter Susquehanna River for several miles above or below the station.

The chain gage was established on the bridge by the United States Geological Survey March 30, 1899. The United States Weather Bureau has also maintained gage-height records at this point since 1888, using a gage on the left pier. The datum of the United States Geological Survey gage was placed 4 feet below the datum of the Weather Bureau gage to obviate negative readings, and was soon after adopted by the Weather Bureau. A Mott-type tape gage was installed by the Weather Bureau in the same position and to the same datum as the chain gage July 20, 1910. The records of stage at this station are utilized by the Weather Bureau for the purpose of flood predictions.

The discharge measurements at this station are now being made by the Water Supply Commission of Pennsylvania. No measurement, however, was made during 1910.

The datum adopted by the United States Geological Survey in 1899 has remained constant. Records obtained by the Weather Bureau prior to the adoption of the Geological Survey gage datum should have 4 feet added to reduce them to the present datum. Discharge measurements are made from the bridge.

The discharge at this point is frequently affected by ice during the winter, and water is often backed up many feet by ice gorges. Conditions of flow are subject to change at irregular intervals. A fairly good discharge rating curve has been developed.

Discharge data for this station prior to 1905 have been revised and republished in Water-Supply Paper 109.

Daily gage height, in feet, of Susquehanna River at Wilkes-Barre, Pa., for 1910.

[Obadiah Hemstreet, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	5.4	20.9	6.8	11.0	6.4	3.7	2.3	2.1	2.7	2.1	4.0
2	2.6	4.9	24.2	6.5	9.0	6.1	3.6	2.3	2.1	2.7	2.1	4.0
3	2.7	5.2	25.9	6.1	9.7	6.0	3.5	2.3	2.1	2.7	2.1	4.0
4	2.6	5.4	24.7	5.8	9.6	5.9	3.4	2.3	2.1	2.7	2.1	3.9
5	2.3	4.8	21.4	5.5	11.2	5.6	3.3	2.3	2.2	2.6	2.5	3.9
6	2.4	4.8	18.7	5.3	9.8	5.4	3.1	2.3	2.3	2.5	2.5	3.8
7	2.7	5.7	18.6	5.3	8.3	5.4	3.1	2.2	2.3	2.5	2.5	3.6
8	3.0	4.5	20.7	5.1	7.3	5.6	3.0	2.2	2.3	2.4	2.4	3.3
9	3.0	4.9	18.1	5.0	6.7	6.7	3.0	2.2	2.3	2.4	2.3	3.2
10	3.1	4.9	15.2	5.0	6.6	6.6	3.0	2.3	2.3	2.4	2.6	3.2
11	3.3	4.5	12.7	4.9	6.4	6.6	2.9	2.3	2.4	2.4	3.0	3.2
12	3.4	4.5	10.9	4.8	6.1	6.1	2.9	2.3	2.4	2.3	3.7	3.0
13	3.3	4.4	10.3	4.6	5.8	6.6	2.9	2.3	2.4	2.3	4.7	2.6
14	3.3	4.3	9.8	4.6	5.5	7.0	2.9	2.3	2.4	2.3	4.5	2.6
15	3.1	4.2	9.4	4.8	5.2	6.5	2.8	2.3	2.4	2.3	4.3	2.8

Daily gage height, in feet, of Susquehanna River at Wilkes-Barre, Pa., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	2.9	4.1	8.8	4.7	4.9	5.9	2.8	2.2	2.3	2.2	4.1	2.7
17	2.9	4.2	8.3	4.4	4.6	5.8	2.8	2.2	2.3	2.2	3.9	2.6
18	3.0	5.3	7.8	4.4	4.5	7.7	2.7	2.1	2.2	2.2	3.9	2.6
19	3.2	5.0	7.4	5.2	4.3	7.6	2.7	2.3	2.2	2.2	3.7	2.9
20	3.5	5.2	7.1	5.3	4.2	7.6	2.6	2.2	2.2	2.1	3.6	3.0
21	3.9	5.6	7.8	5.9	4.2	7.1	2.6	2.3	2.2	2.2	3.5	2.9
22	13.9	6.1	9.9	6.9	4.2	6.2	2.6	2.3	2.2	2.2	3.4	2.7
23	18.7	6.3	10.2	6.8	4.2	5.5	2.5	2.2	2.1	2.2	3.4	2.8
24	15.0	6.4	9.9	6.2	4.2	5.0	2.5	2.1	2.1	2.1	3.3	3.0
25	12.2	6.9	10.0	12.5	4.6	4.6	2.5	2.1	2.3	2.1	3.3	3.3
26	10.1	6.9	10.0	19.8	6.8	4.3	2.5	2.1	2.2	2.1	3.3	3.2
27	8.7	6.1	10.0	15.2	10.8	4.0	2.5	2.1	2.2	2.1	3.7	3.0
28	7.6	10.9	9.5	12.1	10.0	4.2	2.4	2.1	2.3	2.1	4.2	3.6
29	6.9	.....	8.6	9.8	8.6	4.3	2.3	2.1	2.2	2.1	4.2	4.0
30	6.6	.....	7.8	8.9	7.6	3.9	2.3	2.1	2.3	2.1	4.1	4.5
31	5.9	.....	7.2	.....	6.8	.....	2.3	2.1	.....	2.1	.....	4.9

NOTE.—Ice present at this station from about Jan. 1 to 21, about Feb. 6 to 27, and about Dec. 9 to 31. Jan. 1 to Apr. 22 gage heights are about 0.04 foot higher than those published by the Water Supply Commission of Pennsylvania. The effect on the monthly discharge due to this discrepancy is only about 1 or 2 per cent.

Daily discharge, in second-feet, of Susquehanna River at Wilkes-Barre, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,360	9,000	105,000	14,400	34,600	12,800	3,740	1,090	860	1,660	860	4,520
2	1,510	7,260	136,000	13,200	24,400	11,600	3,500	1,090	860	1,660	860	4,520
3	1,660	8,300	153,000	11,600	27,800	11,200	3,270	1,090	860	1,660	860	4,520
4	1,510	9,000	141,000	10,500	27,300	10,800	3,040	1,090	860	1,660	860	4,250
5	1,090	6,930	110,000	9,360	35,700	9,720	2,820	1,090	970	1,510	1,360	4,250
6	1,220	6,500	86,100	8,650	28,300	9,000	2,390	1,090	1,090	1,360	1,360	3,990
7	1,660	6,000	85,300	8,650	21,000	9,000	2,390	970	1,090	1,360	1,360	3,500
8	2,190	5,500	103,000	7,950	16,500	9,720	2,190	970	1,090	1,220	1,220	2,820
9	2,190	5,200	81,300	7,600	14,000	14,000	2,190	970	1,090	1,220	1,090	2,600
10	2,390	5,000	60,000	7,600	13,600	13,600	2,190	1,090	1,090	1,220	1,510	2,600
11	2,820	4,800	44,300	7,260	12,800	13,600	2,000	1,090	1,220	1,220	2,190	2,600
12	3,040	4,600	34,100	6,930	11,600	11,600	2,000	1,090	1,220	1,090	3,740	2,190
13	2,820	4,500	30,900	6,280	10,500	13,600	2,000	1,090	1,220	1,090	6,600	1,510
14	2,820	4,400	28,300	6,280	9,360	15,200	2,000	1,090	1,220	1,090	5,970	1,510
15	2,390	4,200	26,300	6,930	8,300	13,200	1,820	1,090	1,220	1,090	5,360	1,820
16	2,000	4,000	23,400	6,600	7,260	10,800	1,820	970	1,090	970	4,790	1,660
17	2,000	3,900	21,000	5,660	6,280	10,500	1,820	970	1,090	970	4,250	1,510
18	2,190	3,700	18,700	5,660	5,970	18,200	1,660	860	970	970	4,250	1,510
19	2,600	3,500	16,900	8,300	5,360	17,800	1,660	1,090	970	970	3,740	2,000
20	3,270	3,500	15,600	8,650	5,070	17,800	1,510	970	970	860	3,500	2,190
21	4,250	5,000	18,700	10,800	5,070	15,600	1,510	1,090	970	970	3,270	2,000
22	51,600	8,000	28,800	14,800	5,070	12,000	1,510	1,090	970	970	3,040	1,660
23	86,100	6,000	30,400	14,400	5,070	9,360	1,360	970	860	970	3,040	1,820
24	58,700	5,000	28,800	12,000	5,070	7,600	1,360	860	860	860	2,820	2,190
25	41,400	4,000	29,400	43,100	6,280	6,280	1,360	860	1,090	860	2,820	2,820
26	29,900	3,500	29,400	95,400	14,400	5,360	1,360	860	970	860	2,820	2,600
27	22,900	4,000	29,400	60,000	33,500	4,520	1,360	860	970	860	3,740	2,190
28	17,800	34,100	26,800	40,800	29,400	5,070	1,220	860	1,090	860	5,070	2,300
29	14,800	.....	22,400	28,300	22,400	5,360	1,090	860	970	860	5,070	2,400
30	13,600	.....	18,700	23,900	17,800	4,250	1,090	860	1,090	860	4,790	2,400
31	10,800	.....	16,000	.....	14,400	.....	1,090	860	.....	860	.....	2,500

NOTE.—Daily discharge Jan. 1 to 21 and Dec. 9 to 27 so low, by the open channel rating curve, as compared with that at other stations on the Susquehanna, that much backwater from ice seems improbable. The river was frozen over at the gage, but is assumed to have been open at the control point below, in which case there would be no great amount of backwater at the gage. Slight backwater from ice jam may have existed Jan. 22 to 26 and Feb. 28, as the discharge for these days is higher at this station than at Danville. Discharge Feb. 6 to 27 and Dec. 28 to 31, approximate, being deduced from climatologic records and comparisons with determination for other Susquehanna stations. Except for these two periods in February and December, the open channel rating curve has been applied throughout the year, and the daily discharge determined therefrom is considered fairly good.

Monthly discharge of Susquehanna River at Wilkes-Barre, Pa., for 1910.

[Drainage area, 9,810 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	86,100	1,090	12,700	1.29	1.49	B.
February	34,100	3,500	6,410	.653	.68	C.
March	153,000	15,600	51,600	5.26	6.06	A.
April	95,400	5,660	17,100	1.74	1.94	A.
May	35,700	5,070	15,600	1.59	1.83	A.
June	18,200	4,250	11,000	1.12	1.25	A.
July	3,740	1,090	1,950	.199	.23	A.
August	1,090	860	996	.102	.12	B.
September	1,220	860	1,030	.105	.12	B.
October	1,660	860	1,120	.114	.13	B.
November	6,600	860	3,070	.313	.35	A.
December	4,520	1,510	2,610	.266	.31	B.
The year	153,000	860	10,500	1.07	14.51	

SUSQUEHANNA RIVER AT DANVILLE, PA.

This station is located at Mill Street Bridge in Danville. It is 52 miles below Wilkes-Barre and 11 miles above the mouth of West Branch of Susquehanna River. There are no important tributaries within several miles of the station. It was established March 25, 1899, by the United States Geological Survey. It is now being maintained by the Water Supply Commission of Pennsylvania, from whom the table of daily gage heights for 1910 was obtained.

The Susquehanna at this point is paralleled on the north side by the Pennsylvania Canal.

On March 9, 1904, the bridge and chain gage were carried away in an ice freshet, and from that date until March 24, 1905, after the new steel bridge was completed, and when a chain gage was installed on the bridge, observations were made from temporary gages and were constantly liable to error for stages less than 5 feet. With the exception of this period the datum of the chain gage has remained constant during the period of maintenance of the station.

The discharge during the winter is considerably affected by ice.

Discharge measurements are made from the bridge.

The last measurement was made at this station June 25, 1909. It is assumed that the gage was corrected on this date and that a gradual change occurred until March 25, 1911, when the gage was corrected 0.10 foot. The daily gage heights for 1910 have been corrected accordingly. Conditions of flow have heretofore been remarkably permanent at this station and it is therefore believed that the determinations of discharge for 1910 are very good.

Discharge data for this station prior to 1905 have been revised and republished in Water-Supply Paper 109.

Daily gage height, in feet, of Susquehanna River at Danville, Pa., for 1910.

[E. F. Bell, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.84	16.05	5.49	8.64	5.40	3.35	2.08	1.89	2.12	1.96	3.53
2	.....	4.39	19.20	5.23	8.03	5.16	3.25	2.09	1.96	2.27	1.91	3.50
3	.....	4.23	20.57	5.05	7.26	5.26	3.14	2.07	1.96	2.55	1.85	3.43
4	.....	4.32	20.13	5.69	8.39	5.12	3.09	2.05	1.95	2.50	2.06	3.40
5	.....	4.34	17.77	4.60	8.46	4.89	3.03	2.03	1.95	2.42	2.17	3.37
6	.....	4.18	15.75	4.41	8.39	4.94	2.88	1.93	1.95	2.40	2.31	3.33
7	.....	4.12	14.80	4.31	7.34	4.72	2.81	1.98	1.99	2.36	2.41	3.36
8	.....	3.62	16.05	4.23	6.22	4.58	2.84	1.98	2.00	2.30	2.39	3.93
9	.....	3.36	14.90	4.11	5.70	4.92	2.77	2.03	2.01	2.23	2.36	4.35
10	.....	3.46	12.45	4.08	5.49	5.72	2.81	2.13	2.06	2.16	2.33	4.51
11	.....	3.48	10.45	4.05	5.38	5.54	2.68	2.45	2.18	2.09	2.59	4.51
12	3.72	3.60	9.03	3.95	5.16	5.54	2.59	2.30	2.28	2.06	2.83	4.42
13	3.66	3.74	8.20	3.87	4.89	5.54	2.53	2.11	2.24	2.06	3.01	4.23
14	3.69	4.22	7.75	3.74	4.61	5.84	2.53	2.10	2.26	2.04	4.02	4.18
15	3.76	4.46	7.55	3.73	4.44	5.84	2.49	2.06	2.29	2.02	3.73	4.21
16	3.77	4.30	7.30	3.91	4.22	5.82	2.45	2.04	2.18	2.14	3.57	4.03
17	3.86	4.43	6.65	3.75	4.02	6.00	2.58	2.03	2.14	2.02	3.41	3.97
18	4.13	4.64	6.41	4.15	3.80	6.49	2.55	2.02	2.09	2.00	3.37	3.81
19	4.56	4.74	6.00	4.30	3.76	7.14	2.48	2.03	2.04	1.96	3.37	3.76
20	5.06	6.76	5.79	4.80	3.64	7.14	2.40	2.07	2.05	1.95	3.33	3.79
21	6.76	7.51	5.85	5.12	3.68	6.42	2.35	2.09	2.00	1.96	3.17	3.98
22	10.31	9.66	6.95	5.60	3.68	5.74	2.31	2.03	1.95	1.94	3.19	3.93
23	12.51	8.08	7.71	5.80	3.66	5.00	2.31	1.99	1.94	1.97	3.15	3.92
24	10.51	6.31	7.81	5.85	3.71	4.58	2.29	1.97	1.91	1.98	3.10	3.95
25	8.61	5.65	7.87	9.53	4.49	4.16	2.29	1.96	1.89	1.92	3.05	4.31
26	7.54	5.81	7.82	16.51	5.32	3.99	2.31	1.93	2.15	1.94	3.09	4.47
27	6.68	6.58	7.95	13.90	8.24	3.82	2.23	1.88	2.24	1.93	3.07	4.49
28	6.53	8.96	7.64	11.15	8.54	3.64	2.19	1.87	2.12	1.94	3.31	5.35
29	5.91	.....	6.95	8.70	7.78	3.62	2.11	1.87	2.22	1.87	3.61	5.79
30	5.41	.....	6.33	8.72	6.48	3.59	2.08	1.82	2.15	1.92	3.57	5.81
31	5.18	.....	5.85	.....	5.86	.....	2.06	1.86	.....	1.92	.....	6.03

NOTE.—Relation of gage height to discharge probably affected by ice Jan. 1 to 21, Feb. 5 to 27, and Dec. 6 to 31.

Daily discharge, in second-feet, of Susquehanna River at Danville, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,600	12,000	109,000	15,300	34,700	14,800	5,410	1,580	1,220	1,660	1,350	6,120
2	1,780	9,870	154,000	14,000	30,300	13,600	5,030	1,600	1,350	1,930	1,200	6,000
3	1,950	9,140	176,000	13,000	25,300	14,100	4,620	1,560	1,350	2,700	1,160	5,720
4	1,780	9,550	169,000	16,300	32,800	13,400	4,440	1,520	1,330	2,560	1,540	5,600
5	1,280	8,160	133,000	10,900	33,300	12,300	4,230	1,480	1,330	2,350	1,770	5,490
6	1,430	7,650	105,000	9,970	32,800	12,500	3,720	1,290	1,330	2,300	2,080	4,700
7	1,950	7,060	94,100	9,510	25,800	11,400	3,490	1,380	1,400	2,200	2,330	4,120
8	2,580	6,470	109,000	9,140	19,200	10,800	3,590	1,280	1,420	2,060	2,280	3,320
9	2,580	6,120	95,300	8,600	16,400	12,400	3,360	1,480	1,440	1,900	2,200	3,660
10	2,810	5,880	68,800	8,440	15,360	16,500	3,490	1,680	1,540	1,750	2,130	3,060
11	3,320	5,650	49,900	8,320	14,700	15,500	3,080	2,430	1,790	1,600	2,810	3,060
12	3,580	5,410	37,700	7,880	13,600	15,500	2,810	2,060	2,010	1,540	3,560	2,580
13	3,320	5,300	31,500	7,530	12,300	15,500	2,640	1,640	1,920	1,540	4,160	1,780
14	3,320	5,180	28,400	6,970	10,900	17,100	2,640	1,620	1,970	1,500	8,190	1,780
15	2,810	4,940	27,100	6,930	10,100	17,100	2,530	1,540	2,040	1,460	6,930	2,140
16	2,350	4,710	25,600	7,700	9,090	17,000	2,430	1,500	1,790	1,700	6,280	1,950
17	2,350	4,590	21,600	7,010	8,190	18,000	2,780	1,480	1,700	1,460	5,640	1,780
18	2,580	4,350	20,300	8,780	7,220	20,700	2,700	1,460	1,600	1,420	5,490	1,780
19	3,060	4,120	18,000	9,460	7,050	24,600	2,510	1,480	1,500	1,350	5,490	2,350
20	3,850	4,120	16,900	11,800	6,560	24,600	2,300	1,560	1,520	1,330	5,330	2,580
21	5,000	5,880	17,200	13,400	6,720	20,300	2,180	1,600	1,420	1,350	4,730	2,350
22	48,600	9,410	23,400	15,900	6,720	16,600	2,080	1,480	1,330	1,310	4,800	1,950
23	69,400	7,060	28,200	16,900	6,640	12,800	2,080	1,400	1,310	1,370	4,660	2,140
24	50,400	5,880	28,800	17,200	6,840	10,800	2,040	1,370	1,260	1,380	4,480	2,580
25	34,500	4,710	29,200	41,900	10,300	8,820	2,040	1,350	1,220	1,280	4,300	3,320
26	27,100	4,120	28,900	115,000	14,400	8,060	2,080	1,290	1,720	1,310	4,440	3,060
27	21,800	4,710	29,800	84,000	31,800	7,310	1,900	1,210	1,920	1,290	4,370	2,580
28	20,900	37,200	27,700	56,200	33,900	6,560	1,810	1,190	1,660	1,310	5,260	2,710
29	17,500	.....	23,400	35,100	28,600	6,480	1,640	1,190	1,880	1,190	6,440	2,820
30	14,900	.....	19,800	35,300	20,700	6,360	1,580	1,100	1,720	1,280	6,280	2,820
31	13,700	.....	17,200	.....	17,200	.....	1,540	1,170	.....	1,280	.....	2,940

NOTE.—Daily discharge determined from a well-defined discharge rating curve. Discharge for periods during which ice was present estimated from climatologic records and the discharge at Wilkes-Barre.

Monthly discharge of Susquehanna River at Danville, Pa., for 1910.

[Drainage area, 11,100 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	69,400	1,280	12,100	1.09	1.26	C.
February	37,200	4,120	7,470	.673	.70	C.
March	176,000	16,900	56,900	5.13	5.91	A.
April	115,000	6,930	20,900	1.88	2.10	A.
May	34,700	6,560	17,700	1.60	1.84	A.
June	24,600	6,360	14,000	1.26	1.41	A.
July	5,410	1,540	2,860	.258	.30	B.
August	2,430	1,100	1,490	.134	.15	B.
September	2,040	1,220	1,570	.141	.16	B.
October	2,700	1,190	1,640	.148	.17	B.
November	8,190	1,160	4,060	.366	.41	B.
December	6,120	1,780	3,170	.286	.33	C.
The year	176,000	1,100	12,100	1.09	14.74	

SUSQUEHANNA RIVER AT HARRISBURG, PA.

This station is located at the Walnut Street Bridge at Harrisburg. Daily observations of stage were begun at Harrisburg in 1890 by E. Mather, president of the Harrisburg Water Board. The original gage is located in the pump well at the pump house of the city waterworks, the well being connected with the river by two large mains. On July 18, 1904, a chain gage was installed on the Walnut Street Bridge. The readings are now furnished by the United States Weather Bureau, which has maintained the station since July 15, 1906.

The river is divided into two channels at this point by Foster Island, which is overflowed at times of flood.

Conodoguinet Creek enters Susquehanna River from the west about 2 miles above the gaging station. Paxton Creek enters from the northeast, about 1½ miles below the station. The Pennsylvania Canal parallels the river on the left side.

The datums of both gages have remained constant since their establishment. For full information regarding the two gages, changes in conditions of flow, etc., see Water-Supply Papers 109 and 167.

Discharge measurements are made from the bridge. The discharge at this point is affected by ice.

Conditions of flow here have been relatively permanent during the last few years and a good discharge rating curve has been developed.

No measurement has been made at this station, so far as known, since September 12, 1908. On December 30, 1910, the observer shortened the chain 0.05 foot. No corrections has been made in 1910 gage heights for possible error of gage. Comparisons of the discharge at this station with provisional estimates for the McCall Ferry station indicate that the Harrisburg records published below are very good.

Discharge data for this station prior to 1905 have been revised and republished in Water-Supply Paper 109.

Daily gage height, in feet, of Susquehanna River at Harrisburg, Pa., for 1910.

[E. R. Demain, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.4	3.3	11.9	3.7	6.5	3.8	2.3	0.7	0.7	1.7	0.6	1.9
2	1.5	2.9	16.2	3.5	6.3	3.5	2.2	.7	.9	1.5	.7	1.9
3	1.5	2.8	17.2	3.3	5.7	3.4	2.1	.7	1.0	1.2	.6	1.9
4	1.4	2.4	16.8	3.1	5.2	4.2	1.9	.6	.9	1.2	.6	1.9
5	1.5	2.6	15.1	3.0	5.4	3.9	1.8	.6	.9	1.2	.7	1.9
6	1.5	2.6	12.8	2.8	5.5	3.7	1.8	.6	1.0	1.1	.7	1.1
7	1.8	2.1	11.5	2.8	5.1	3.8	1.6	.6	1.3	1.0	.7	1.3
8	2.0	3.6	12.4	2.6	4.6	3.6	1.6	.5	1.5	1.0	.9	1.3
9	2.6	4.4	12.2	2.6	4.2	3.4	1.6	.7	1.4	.9	1.0	1.4
10	3.1	5.2	10.1	2.5	4.0	3.5	1.6	.7	1.4	.8	.9	1.3
11	2.8	5.7	8.4	2.4	4.0	4.1	1.5	.8	1.2	.8	.9	1.6
12	2.5	5.2	7.1	2.3	3.7	4.8	1.4	.9	1.2	.8	.8	2.1
13	2.4	5.4	6.3	2.2	3.5	5.4	1.4	.9	1.2	.7	.9	2.8
14	2.3	5.4	5.7	2.2	3.3	5.2	1.4	.9	1.3	.7	1.2	2.9
15	2.2	5.6	5.5	2.1	3.0	4.9	1.3	.8	1.4	.6	1.8	3.0
16	2.5	5.4	5.2	2.0	2.9	4.6	1.4	.7	1.3	.6	1.8	2.0
17	2.4	5.5	4.9	2.0	2.7	5.3	1.4	.7	1.2	.6	1.7	2.1
18	2.3	6.1	4.5	2.4	2.6	6.6	1.3	.6	1.0	.5	1.7	2.2
19	2.2	5.4	4.3	2.9	2.5	6.5	1.4	.6	.9	.5	1.6	2.4
20	2.7	5.0	4.1	4.2	2.4	5.7	1.4	.6	.8	.6	1.5	2.3
21	3.1	4.8	3.9	5.3	2.4	5.2	1.3	.6	.8	.6	1.5	2.0
22	10.7	5.9	4.3	5.4	2.5	4.6	1.2	.7	.7	.6	1.4	1.9
23	12.4	7.0	5.2	5.4	2.5	4.1	1.1	.6	.6	.6	1.4	2.1
24	10.8	6.1	5.5	5.5	2.5	3.6	1.0	.6	.6	.6	1.4	2.2
25	8.5	5.0	5.4	9.6	3.2	3.2	1.0	.6	.6	.6	1.3	2.1
26	6.8	4.6	5.4	14.8	3.9	2.9	.9	.5	.6	.7	1.3	2.2
27	5.7	4.4	5.4	14.9	5.1	2.7	.8	.5	.8	.6	1.2	2.4
28	4.9	6.1	5.3	11.4	5.7	2.6	1.0	.5	1.1	.7	1.3	2.4
29	4.4	.....	4.9	8.9	5.4	2.5	.9	.5	1.2	.7	1.5	2.5
30	3.8	.....	4.4	7.2	4.7	2.4	.8	.4	1.7	.7	1.9	2.4
31	3.6	.....	4.0	.....	4.2	.....	.7	.4	.....	.6	.....	2.5

NOTE.—Relation of gage height to discharge probably affected by ice Jan. 1 to 20, Feb. 8 to 27, and Dec. 11 to 31.

Gage heights published by the Water Supply Commission of Pennsylvania vary from about 0.01 foot to 0.05 foot less than those given in the above table. The gage heights by the Survey were not revised because the comparisons of Harrisburg and McCall Ferry discharges appear to indicate that they give better values.

Daily discharge, in second-feet, of Susquehanna River at Harrisburg, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,210	26,900	188,000	32,200	77,400	33,600	15,800	4,830	4,830	10,800	4,380	12,300
2	3,560	22,100	297,000	29,400	73,700	29,400	14,900	4,830	5,820	9,400	4,830	12,300
3	4,010	21,000	325,000	26,900	63,400	28,100	14,000	4,830	6,360	7,490	4,380	12,300
4	3,800	16,800	314,000	24,400	55,100	39,200	12,300	4,380	5,820	7,490	4,380	12,300
5	3,060	18,800	267,000	23,300	58,400	35,000	11,600	4,380	5,820	7,490	4,830	12,300
6	3,120	18,800	209,000	21,000	60,000	32,200	11,600	4,380	6,360	6,910	4,830	6,910
7	4,880	14,000	179,000	21,000	53,500	33,600	10,100	4,380	8,100	6,360	4,830	8,100
8	6,890	14,100	200,000	18,800	45,400	30,800	10,100	3,960	9,400	6,360	5,820	8,100
9	6,150	13,700	195,000	18,800	39,200	28,100	10,100	4,830	8,740	5,820	6,360	8,740
10	5,810	13,200	148,000	17,800	36,400	29,400	10,100	4,830	8,740	5,310	5,820	8,100
11	6,200	12,600	113,000	16,800	36,400	37,800	9,400	5,310	7,490	5,310	5,820	7,700
12	6,270	11,700	88,500	15,800	32,200	48,600	8,740	5,820	7,490	5,310	5,310	7,200
13	5,830	11,200	73,700	14,900	29,400	58,400	8,740	5,820	7,490	4,830	5,820	6,700
14	5,700	10,800	63,400	14,900	26,900	55,100	8,740	5,820	8,100	4,830	7,490	6,500
15	4,950	10,300	60,000	14,000	23,300	50,200	8,100	5,310	8,740	4,380	11,600	6,300
16	4,260	9,770	55,100	13,200	22,100	45,400	8,740	4,830	8,100	4,380	11,600	6,100
17	4,140	11,200	50,200	13,200	19,900	56,800	8,740	4,830	7,490	4,380	10,800	6,000
18	4,420	11,500	43,800	16,800	18,800	79,200	8,100	4,380	6,360	3,960	10,800	6,000
19	4,750	10,400	40,700	22,100	17,800	77,400	8,740	4,380	5,820	3,960	10,100	5,900
20	9,690	11,900	37,800	39,200	16,800	63,400	8,740	4,380	5,310	4,380	9,400	5,800

Daily discharge, in second-feet, of Susquehanna River at Harrisburg, Pa., for 1910—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	24,400	17,200	35,000	56,800	16,800	55,100	8,100	4,380	5,310	4,380	9,400	5,800
22	161,000	27,700	40,700	58,400	17,800	45,400	7,490	4,830	4,830	4,380	8,710	5,800
23	200,000	24,800	55,100	58,400	17,800	37,800	6,910	4,380	4,380	4,380	8,740	5,700
24	163,000	18,400	60,000	60,000	17,800	30,800	6,360	4,380	4,380	4,380	8,740	5,700
25	115,000	13,200	58,400	137,000	25,600	25,600	6,360	4,380	4,380	4,380	8,100	5,700
26	82,900	12,500	58,400	260,000	35,000	22,100	5,820	3,960	4,380	4,830	8,100	6,000
27	63,400	16,900	58,400	262,000	53,500	19,900	5,310	3,960	5,310	4,380	7,490	6,000
28	50,200	70,200	56,800	177,000	63,400	18,800	6,360	3,960	6,910	4,830	8,100	6,000
29	42,200	.....	50,200	123,000	58,400	17,800	5,820	3,960	7,490	4,830	9,400	6,500
30	33,600	.....	42,200	90,400	47,100	16,800	5,310	3,570	10,800	4,830	12,300	6,500
31	30,800	.....	36,400	.....	39,200	.....	4,830	3,570	.....	4,380	.....	7,000

NOTE.—Daily discharge determined from a fairly well-defined discharge rating curve. Discharge for periods during which ice was present determined by dividing the total discharge of the Danville, Williamsport, and Newport stations by 0.81.

Monthly discharge of Susquehanna River at Harrisburg, Pa., for 1910.

[Drainage area, 24,000 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	200,000	3,060	34,400	1.43	1.65	B.
February	70,200	9,770	17,900	.746	.78	C.
March	325,000	35,000	113,000	4.71	5.43	A.
April	262,000	13,200	56,600	2.36	2.63	A.
May	77,400	16,800	38,700	1.61	1.86	A.
June	79,200	16,800	39,400	1.64	1.83	A.
July	15,800	4,830	8,900	.371	.43	B.
August	5,820	3,570	4,580	.191	.22	A.
September	10,800	4,380	6,680	.278	.31	A.
October	10,800	3,960	5,460	.228	.26	A.
November	12,300	4,380	7,610	.317	.35	A.
December	12,300	5,700	7,500	.312	.36	B.
The year	325,000	3,060	28,500	1.19	16.11	

SUSQUEHANNA RIVER NEAR McCALL FERRY, PA.

The cable from which discharge measurements were made at this station is located about 1 mile above the village of McCall Ferry in a narrow and rocky part of Susquehanna River, about 20 miles above its mouth. The two principal gages to which the measurements are referred are gage No. 2, about three-fourths of a mile below McCall Ferry, and gage No. 5, about 2 miles below McCall Ferry. This station was established May 17, 1902, by Mr. Boyd Ehle. The station was maintained to determine the discharge of the river for the McCall Ferry power development and to check the accuracy of the records obtained at Harrisburg.

The datum of each gage has remained constant since its establishment. The gage readings give the elevation of the water surface above sea level direct. Gage No. 2, which is located in the tailrace of the power house was used until February 28, 1906, when operations at the dam caused backwater to affect the relation between discharge

and gage heights. All readings published since then have been referred to gage No. 5, which is located at the foot of Cullys Falls, entirely out of the direct influence of the dam.

The discharge is affected by ice during severe winters. Discharge measurements made at this station have been referred to gages Nos. 2 and 5. Conditions of flow are permanent, and an excellent discharge rating curve was developed for gages Nos. 2 and 5.

The dam has caused a change in distribution of flow resulting in change in the relation of gage height to discharge as referred to the Cullys Falls gage. On December 1, 1910, a new gage was established on Face Rock about 300 feet below the Cullys Falls gage. In addition there has been maintained for several years a gage at Fites Eddy, about 3 miles below the dam. Data are withheld for the present at this station until a suitable discharge rating curve can be derived for one of the lower gages.

Discharge data for this station prior to 1905 have been revised and republished in Water-Supply Paper 109.

CHENANGO RIVER AT BINGHAMTON, N. Y.

Chenango River rises in the central part of Madison County, N. Y., and flows southward into the Susquehanna at Binghamton. It is approximately 70 miles long, and its drainage area comprises about 1,580 square miles. Its headwater valleys lie at an elevation of about 1,200 feet above sea level, and its mouth is 864 feet above sea level. Its bed is, as a rule, composed of sand and gravel, and the stream is bordered in many places by bottom lands subject to overflow. A portion of the headwaters are diverted across the Chenango–Mohawk divide through Oriskany Creek to feed the summit level of the Erie Canal.

Considerable power is developed on the Chenango.

The gaging station, which is located at the Court Street Bridge at Binghamton, was established July 31, 1901, and has since been maintained in cooperation with the New York State engineer department.

Tioughnioga River enters Chenango River from the northwest about 14 miles above the gaging station. Chenango River enters Susquehanna River about three-fourths of a mile below the gaging station, but a slight riffle a short distance downstream from the bridge cuts off backwater from the Susquehanna at ordinary stages.

In estimating the run-off of Chenango River the area directly tributary to storage reservoirs, from which water is diverted to the Erie Canal, has been deducted from the total natural drainage area. The diversion area of six reservoirs at the head of Chenango River, whose outflow is turned into Erie Canal through Limestone Creek, is 30 square miles. The diversion area of De Ruyter reservoir, at the head of Tioughnioga River, whose outflow is turned into Erie

Canal through Limestone Creek, is 18 square miles. These two areas have been subtracted from the natural drainage area of 1,580 square miles, giving an effective area of 1,532 square miles. This estimate is approximate, as no allowance for direct inflow to feeder channels from additional areas, nor for waste into the original stream, has been made. The gross area from which more or less run-off is diverted is about 105 square miles.

About 1 mile upstream is the dam of the Binghamton Cold Storage Co. This is a low structure with 5-foot head, built of large blocks of bluestone, laid dry, and allowing a large amount of leakage. Owing to this leakage and to the fact that the water wheels run continuously night and day, the regimen of the stream below is not materially affected, and fluctuations in gage height are due almost entirely to natural causes. The next dam upstream is at Willards, about 16 miles above Binghamton and 2 miles above Chenango Forks.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station.

Discharge measurements are made from the bridge.

During the winter months the discharge is usually more or less affected by the presence of ice.

The discharge rating curve for low and medium stages is not very well developed. Lack of sufficient discharge measurements and the effects of backwater from Susquehanna River may have caused considerable error in the high-water estimates. Measurements made during 1910 indicate that conditions of flow have remained constant at this station.

Information in regard to this station is contained in the reports of the State engineer and surveyor, State of New York.

Discharge measurements of Chenango River at Binghamton, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Feet.*	*Sec.-ft.*
Mar. 7	W. G. Hoyt	320	4,120	16.82	23,400
May 9	C. C. Covert	310	873	6.50	2,030
July 26[a]	Hoyt and Carman	160	186	4.95	132

[a] Measurement made at wading section below bridge.

Daily gage height, in feet, of Chenango River at Binghamton, N. Y., for 1910.

[H. L. Smith, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.25	6.4	18.25	7.2	6.5	6.95	5.4	5.1	5.2	5.8	5.4	6.4
2	5.25	6.25	21.4	6.95	6.9	.....	5.4	5.1	5.1	5.7	5.4	6.3
3	5.3	6.4	19.0	6.7	6.85	6.75	5.3	5.2	5.05	5.6	5.2	6.25
4	5.25	6.3	16.75	6.5	8.75	.....	5.35	5.15	5.2	5.6	5.3	6.2
5	5.35	6.1	14.15	6.45	7.75	6.3	5.3	5.15	5.35	5.5	5.5	6.2

Daily gage height, in feet, of Chenango River at Binghamton, N. Y., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
6	5.2	6.1	13.9	6.35	7.2	7.25	5.3	5.15	5.5	5.45	5.45	6.0
7	5.3	5.75	15.75	6.3	6.8	7.75	5.3	5.15	5.6	5.45	5.9	5.9
8	5.3	5.7	14.6	6.4	6.6	7.9	5.3	5.15	5.7	5.45	5.9	5.95
9	5.4	5.95	12.5	6.3	6.5	7.15	5.3	5.15	5.65	5.35	5.85	5.8
10	5.4	6.05	10.45	6.3	6.75	6.75	5.25	5.2	5.4	5.45	6.0	5.65
11	5.4	6.0	9.4	6.15	6.5	6.75	5.2	5.1	5.3	5.45	7.15	5.8
12	5.3	5.85	8.95	6.35	6.45	7.9	5.2	5.2	5.35	5.35	7.1	5.85
13	5.35	5.8	9.0	6.4	6.25	7.6	5.2	5.2	5.3	5.4	6.75	5.9
14	5.3	5.75	8.8	6.15	6.15	7.1	5.15	5.2	5.6	5.4	6.55	5.8
15	5.2	5.85	8.3	6.05	6.1	6.6	5.1	5.2	5.45	5.4	6.48	5.9
16	5.3	5.9	7.8	6.0	6.0	6.5	5.2	5.15	5.3	5.05	6.45	5.75
17	5.3	5.95	7.7	5.9	5.9	6.85	5.25	5.2	5.25	5.4	6.35	5.6
18	5.4	6.0	7.3	5.9	5.9	6.45	5.3	5.2	5.1	5.4	6.25	5.7
19	5.6	5.95	7.25	6.3	6.0	6.9	5.1	5.2	5.1	5.3	6.25	5.85
20	6.3	5.9	7.9	6.35	5.9	6.5	5.1	5.1	5.4	5.35	6.2	5.8
21	6.7	6.1	9.4	6.2	6.05	6.2	5.1	5.2	5.2	5.1	6.1	5.85
22	12.2	6.65	9.3	6.1	6.3	5.95	5.1	5.2	5.2	5.3	6.1	5.7
23	12.5	7.1	9.25	6.0	6.15	5.8	5.1	5.15	5.2	5.0	6.05	5.65
24	10.95	6.75	9.3	5.9	6.1	5.75	5.0	5.15	5.1	5.3	6.1	5.8
25	9.2	6.4	9.55	6.15	6.85	5.65	5.1	5.25	5.05	5.3	6.55	6.1
26	8.1	6.7	9.8	6.7	10.1	5.6	4.95	5.2	5.25	5.2	6.85	6.2
27	7.6	6.1	9.4	7.0	8.85	5.55	5.05	5.15	6.1	5.35	6.7	6.1
28	7.35	12.65	8.35	6.7	8.25	5.5	5.1	5.1	5.9	5.35	6.4	6.05
29	7.1	.....	7.9	6.3	7.5	5.55	5.3	5.1	6.5	5.35	6.4	6.15
30	6.5	.....	7.6	6.65	7.0	5.45	5.2	5.1	6.0	5.2	6.35	7.7
31	6.4	.....	7.4	.....	7.05	.....	5.2	5.15	.....	5.4	.....	8.5

NOTE.—Relation of gage height to discharge probably affected by ice from Jan. 1 to 21, Feb. 9 to 27, and Dec. 8 to 31. Gage heights taken to water surface except Jan. 3 to 21 and Dec. 18, which were taken to the top of the ice.

Daily discharge, in second-feet, of Chenango River at Binghamton, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,620	26,200	2,760	1,760	2,400	460	235	305	850	460	1,620
2	.....	1,410	34,600	2,400	2,320	2,260	460	235	235	745	460	1,480
3	.....	1,620	28,200	2,040	2,250	2,110	380	305	202	645	305	1,410
4	.....	1,480	22,400	1,760	5,300	1,800	420	270	305	645	380	1,340
5	.....	1,210	16,200	1,680	3,620	1,480	380	270	420	550	550	1,340
6	.....	1,210	15,600	1,550	2,760	2,840	380	270	550	505	505	1,080
7	.....	798	20,000	1,480	2,180	3,620	380	270	645	505	960	960
8	.....	745	17,300	1,620	1,900	3,860	380	270	745	505	960	.....
9	.....	.....	12,600	1,480	1,760	2,690	380	270	695	420	905	.....
10	.....	.....	8,420	1,480	2,110	2,110	342	305	460	505	1,080	.....
11	.....	.....	6,460	1,280	1,760	2,110	305	235	380	505	2,690	.....
12	.....	.....	5,650	1,550	1,680	3,860	305	305	420	420	2,620	.....
13	.....	.....	5,740	1,620	1,410	3,380	305	305	380	460	2,110	.....
14	.....	.....	5,390	1,280	1,280	2,620	270	305	645	460	1,820	.....
15	.....	.....	4,520	1,140	1,210	1,900	235	305	505	460	1,730	.....
16	.....	.....	3,700	1,080	1,080	1,760	305	270	380	202	1,680	.....
17	.....	.....	3,540	960	960	2,250	342	305	342	460	1,550	.....
18	.....	.....	2,920	960	960	1,680	380	305	235	460	1,410	.....
19	.....	.....	2,840	1,480	1,080	2,320	235	305	235	380	1,410	.....
20	.....	.....	3,860	1,550	960	1,760	235	235	460	420	1,340	.....
21	.....	.....	6,460	1,340	1,140	1,340	235	305	305	235	1,210	.....
22	12,000	.....	6,280	1,210	1,480	1,020	235	305	305	380	1,210	.....
23	12,600	.....	6,190	1,080	1,280	850	235	270	305	170	1,140	.....
24	9,400	.....	6,280	960	1,210	798	170	270	235	380	1,210	.....
25	6,100	.....	6,730	1,280	2,250	695	235	342	202	380	1,820	.....
26	4,180	.....	7,190	2,040	7,760	645	142	305	342	305	2,250	.....
27	3,380	.....	6,460	2,470	5,480	598	202	270	1,210	420	2,040	.....
28	2,990	12,900	4,610	2,040	4,440	550	235	235	960	420	1,620	.....
29	2,620	.....	3,860	1,480	3,220	598	380	235	1,760	420	1,620	.....
30	1,760	.....	3,380	1,960	2,470	505	305	235	1,080	305	1,550	.....
31	1,620	.....	3,060	.....	2,540	.....	305	270	.....	460	.....	.....

NOTE.—Daily discharge determined from discharge rating curve not very well defined.

Monthly discharge of Chenango River at Binghamton, N. Y., for 1910.

[Drainage area, 1,530 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	12,600	.....	2,060	1.35	1.56	D.
February	12,900	.....	1,430	.935	.97	D.
March	34,600	2,840	9,890	6.46	7.45	B.
April	2,760	960	1,570	1.03	1.15	B.
May	7,760	960	2,310	1.51	1.74	B.
June	3,860	505	1,880	1.23	1.37	B.
July	460	142	308	.201	.23	B.
August	342	235	278	.182	.21	B.
September	1,760	202	508	.332	.37	B.
October	850	170	451	.295	.34	B.
November	2,690	305	1,350	.882	.98	B.
December	.....	.....	646	.422	.49	D.
The year	34,600	142	1,890	1.24	16.86	

NOTE.—Discharge for periods during which ice was present estimated by means of climatologic records and record of discharge at Wilkes-Barre.

Mean discharge Jan. 1 to 21 estimated 350 second-feet; no great variation in discharge.

Mean discharge Feb. 9 to 27 estimated 900 second-feet, ranging from about 500 second-feet to about 2,000 second-feet.

Mean discharge Dec. 8 to 31 estimated 450 second-feet; no great variation in discharge.

Determinations for January, February, and December published in the tenth annual report of the New York State engineer and surveyor, revised.

CHEMUNG RIVER AT CHEMUNG, N. Y.

Chemung River is formed near Painted Post, in the southeastern part of Steuben County, N. Y., by the confluence of Cohocton and Tioga rivers.

Chemung River proper is about 40 miles long. It flows eastward through the cities of Corning, Elmira, and Chemung and enters the Susquehanna at Athens, Bradford County, Pa. Near Chemung the river crosses the State line into Pennsylvania, and about 2 miles farther east it reenters New York, where it flows for a distance of about 4 miles, when it again crosses into Pennsylvania for the last 5 miles of its course. The drainage area above the mouth measures about 2,520 square miles.

The cities of Corning and Elmira have built extensive dikes to confine the waters at all stages. The stream has a yearly range from about 100 second-feet to about 30,000 second-feet. One of the greatest floods recorded was on June 1, 1889. It was preceded by a phenomenal rainfall, aggregating several inches in a few hours, during the night of May 31. The discharge has been estimated at 67 second-feet per square mile from 2,055 square miles, or 138,000 second-feet.[1]

The gaging station which is located at the suspension highway bridge midway between Willawana, Pa., and Chemung, N. Y., about one-half mile upstream from the State line and 1 mile below the Erie Railroad bridge, was established September 7, 1903, and is maintained in cooperation with the New York State engineer department.

[1] Report of Francis Collingwood, C. E., on the protection of the city of Elmira, N. Y., against floods.

The Chemung was formerly paralleled by a canal taking its supply from dams across the stream. This canal has been abandoned, and the diversion dams are no longer in existence. At present the largest water-power development is at Elmira, N. Y. There are no dams between Elmira, N. Y., and the mouth of Chemung River.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station.

Conditions for obtaining accurate discharge measurements during the open period are only fair. At extreme high water the left bank is flooded, and at low stages there is more or less change in conditions of flow from year to year. On account of the numerous small riffs, considerable needle ice forms in this stream during the winter months. This collects under the ice in the smooth section at the gage and causes backwater.

Discharge measurements are made from the bridge and by wading at low stages.

Information in regard to this station is contained in the reports of the State engineer and surveyor, State of New York.

The following discharge measurement was made by W. G. Hoyt in 1910:

July 25: Width, 204 feet; area, 243 square feet; gage height, 1.99 feet; discharge, 233 second-feet.

Daily gage height, in feet, of Chemung River at Chemung, N. Y., for 1910.

[D. L. Orcutt, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.94	14.62	3.56	7.00	3.65	2.36	1.78	1.72	2.36	1.78	2.84
2	.....	2.84	14.48	3.38	8.40	3.51	2.31	1.84	1.72	2.13	1.81	2.86
3	.....	3.00	12.90	3.21	8.15	3.38	2.25	1.86	1.76	2.08	1.82	2.60
4	.....	2.76	10.86	3.14	9.24	3.24	2.21	1.86	1.81	2.06	1.84	2.61
5	.....	2.60	9.46	3.24	7.47	3.19	2.22	1.80	1.86	1.92	1.83	2.57
6	.....	3.67	9.83	3.24	6.31	3.13	2.19	1.73	1.88	1.94	1.77	2.40
7	.....	.....	11.92	3.13	5.57	3.15	2.23	1.75	2.04	1.90	1.76	2.62
8	.....	.....	9.46	3.00	5.07	3.15	2.13	1.72	2.01	1.80	1.77	2.57
9	.....	.....	7.38	3.00	4.79	3.08	2.19	1.76	2.04	1.83	1.80	2.50
10	.....	.....	6.26	2.92	4.69	2.91	2.08	1.82	2.05	1.86	1.83	2.40
11	.....	.....	5.68	2.74	4.37	3.03	2.10	1.80	2.38	1.86	1.89	.....
12	.....	.....	5.36	2.70	4.08	3.35	2.11	1.84	1.85	1.81	1.91	.....
13	.....	.....	5.16	2.71	3.87	3.33	.....	1.87	1.92	1.76	1.98	.....
14	.....	.....	5.04	2.66	3.66	3.13	.....	1.86	1.78	1.78	2.12	.....
15	.....	.....	4.58	2.50	3.51	2.99	2.48	1.74	1.76	1.79	2.14	.....
16	.....	.....	4.38	2.52	3.41	2.87	2.17	1.82	1.78	1.74	2.04	.....
17	.....	.....	4.30	2.48	3.29	3.37	2.10	1.80	1.74	1.64	2.20	.....
18	.....	.....	4.08	2.51	3.19	4.15	2.12	1.75	1.78	1.72	2.18	.....
19	.....	.....	3.98	4.14	3.09	4.85	2.08	1.76	1.71	1.71	2.20	.....
20	.....	.....	4.65	4.88	3.04	3.93	2.06	1.74	1.74	1.70	2.13	.....
21	.....	.....	6.25	5.36	3.13	3.49	2.02	1.74	1.72	1.60	2.10	.....
22	11.62	.....	5.92	4.04	3.16	3.21	1.94	1.71	1.78	1.66	2.08	.....
23	8.76	.....	5.87	4.64	3.10	3.01	1.96	1.80	1.67	1.62	2.08	.....
24	6.01	.....	5.82	8.08	3.43	2.85	1.96	1.78	1.72	1.62	2.05	.....
25	5.00	.....	5.82	16.56	4.65	2.74	1.98	1.75	1.72	1.72	2.09	.....
26	4.26	.....	5.66	14.10	6.01	2.47	2.02	1.70	1.85	1.68	2.14	.....
27	3.97	.....	5.02	10.76	5.07	2.53	1.87	1.74	1.83	1.73	2.38	.....
28	3.71	11.18	4.61	7.39	4.50	2.47	1.92	1.73	2.58	1.76	2.42	.....
29	3.46	.....	4.24	6.16	4.05	2.40	1.89	1.68	2.62	1.78	2.50	.....
30	3.04	.....	4.00	9.00	3.80	2.41	1.87	1.74	2.49	1.78	2.64	.....
31	3.08	.....	3.80	.....	3.75	.....	1.86	1.72	.....	1.78	.....	.....

NOTE.—Relation of gage height to discharge probably affected by ice Jan. 1 to 21, Feb. 6 to 27, and Dec. 7 to 31.

Daily discharge, in second-feet, of Chemung River at Chemung, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	888	42,400	1,590	9,220	1,710	444	133	112	444	133	799
2	.....	800	41,700	1,360	13,600	1,520	412	156	112	298	144	816
3	.....	945	33,000	1,160	12,800	1,360	372	164	126	269	148	610
4	.....	733	23,400	1,090	16,700	1,200	346	164	144	258	156	618
5	.....	610	17,500	1,200	10,600	1,140	353	140	164	189	152	589
6	.....	.....	19,000	1,200	7,360	1,080	334	116	172	198	130	470
7	.....	.....	28,300	1,080	5,460	1,100	360	122	247	180	126	.....
8	.....	.....	17,500	945	4,270	1,100	298	112	230	140	130	.....
9	.....	.....	10,300	945	3,670	1,020	334	126	247	152	140	.....
10	.....	.....	7,230	869	3,470	860	269	148	252	164	152	.....
11	.....	.....	5,730	717	2,860	975	280	140	457	164	176	.....
12	.....	.....	4,940	685	2,360	1,320	286	156	160	144	184	.....
13	.....	.....	4,480	693	2,030	1,300	286	168	189	126	216	.....
14	.....	.....	4,210	656	1,720	1,080	526	164	133	133	292	.....
15	.....	.....	3,250	540	1,520	936	526	119	126	136	304	.....
16	.....	.....	2,870	554	1,400	825	322	148	133	119	247	.....
17	.....	.....	2,730	536	1,250	1,350	280	140	119	87	340	.....
18	.....	.....	2,340	547	1,140	2,480	292	122	133	112	328	.....
19	.....	.....	2,200	2,460	1,040	3,800	269	126	108	108	340	.....
20	.....	.....	3,390	3,860	985	2,120	258	119	119	105	298	.....
21	.....	.....	7,200	4,940	1,080	1,500	236	119	112	75	280	.....
22	26,900	.....	6,340	2,290	1,110	1,160	198	108	133	93	269	.....
23	14,900	.....	6,210	3,370	1,040	955	207	140	96	81	269	.....
24	6,580	.....	6,080	12,600	1,420	808	207	133	112	81	252	.....
25	4,120	.....	6,080	52,100	3,390	717	216	122	112	112	274	.....
26	2,660	.....	5,680	39,800	6,580	519	236	105	160	99	304	.....
27	2,180	.....	4,160	22,900	4,270	561	168	119	152	116	457	.....
28	1,790	24,800	3,310	10,400	3,100	519	189	116	596	126	484	.....
29	1,460	.....	2,630	6,970	2,310	470	176	99	625	133	540	.....
30	985	.....	2,230	15,800	1,920	477	168	119	533	133	640	.....
31	1,020	.....	1,920	.....	1,850	.....	164	112	.....	133	.....	.....

NOTE.—Daily discharge determined from a fairly well defined discharge rating curve. Discharge July 13 and 14 estimated.

Monthly discharge of Chemung River at Chemung, N. Y., for 1910.

[Drainage area, 2,440 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	26,900	.....	2,260	0.926	1.07	D.
February	24,800	.....	1,500	.615	.64	D.
March	42,400	1,920	10,600	4.34	5.00	A.
April	52,100	536	6,460	2.65	2.96	A.
May	16,700	985	4,240	1.74	2.01	A.
June	3,800	470	1,200	.492	.55	A.
July	526	164	291	.119	.14	B.
August	168	99	131	.054	.062	B.
September	625	96	204	.084	.094	B.
October	444	75	152	.062	.071	B.
November	640	126	264	.108	.12	B.
December	816	.....	448	.184	.21	D.
The year	26,900	75	2,310	.947	12.92	

NOTE.—Discharge for periods during which ice existed estimated by means of climatologic records, and record of discharge at Wilkes-Barre and at Rochester.

Mean discharge Jan. 1 to 21 estimated 350 second-feet; probably about constant.

Mean discharge Feb. 6 to 27 estimated 600 second-feet, ranging from about 400 second-feet to about 1,500 second-feet.

Mean discharge Dec. 7 to 31 estimated 400 second-feet; probably about constant.

WEST BRANCH OF SUSQUEHANNA RIVER AT WILLIAMSPORT, PA.

The West Branch of Susquehanna River rises in the mountains of Cambria County, at an elevation of not less than 2,000 feet above sea level, flows northeastward, and then southeastward into the Susquehanna above Sunbury. Its length is about 425 miles, and its drainage area, measured at the mouth, comprises approximately 7,030 square miles, all in Pennsylvania.

The river was navigable, by means of the canal along its banks, to Lock Haven and beyond, prior to 1889, there being four canal dams on the stream, the ponds of which were used for navigation. The flood of 1889 so damaged the upper portion of the canal that it was not operated subsequent to that date above Muncy. From Muncy to Northumberland it was operated as late as 1897. No water was flowing in the canal at the Williamsport gaging station in 1895.

The gaging station is located at the Market Street Bridge in Williamsport. Lycoming Creek enters Susquehanna River from the north about 2 miles above the station, and Loyalsock Creek, also from the north, enters about 2 miles below the station. It was established March 1, 1895, by George D. Snyder, who was at that time city engineer of Williamsport.

A standard chain gage was installed on the bridge by the United States Geological Survey August 16, 1901. The gage is now maintained by the United States Weather Bureau, from whom the daily readings are obtained.

The datum of the gage has been unchanged since the establishment of the station.

The discharge is usually affected by ice during the winter period.

There is a dam about one-half mile above the station, but it is believed that it has no effect on the relation of discharge to gage height.

Discharge measurements are made from the bridge or by wading.

No measurement has been made at this station in 1910, and so far as known the chain gage has not been checked since September 8, 1908. Conditions of flow have probably remained constant since that time, although the determined low-water discharge may be somewhat too high because of stretching of the chain.

Discharge data for this station prior to 1905 have been revised and republished in Water-Supply Paper 109.

Daily gage height, in feet, of West Branch of Susquehanna River at Williamsport, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.4	2.4	16.0	3.4	6.0	3.0	1.3	0.4	0.2	1.4	0.4	1.4
2	.4	2.0	16.0	3.1	5.6	2.8	1.2	.4	.2	.9	.4	1.7
3	.5	2.4	15.4	2.9	5.3	2.7	1.2	.3	.2	.8	.4	1.5
4	.7	2.3	14.3	2.7	5.1	2.7	1.2	.3	.4	.7	.4	1.4
5	.6	2.2	12.7	2.6	4.9	2.6	1.1	.3	1.0	.7	.4	1.2
6	.6	2.2	11.4	2.5	4.6	2.6	1.0	.3	1.3	.6	.4	1.1
7	1.7	2.8	12.8	2.5	4.6	2.5	.9	.3	1.5	.5	.4	1.0
8	2.1	2.4	13.7	2.5	4.5	2.6	.8	.3	1.2	.5	.4	.9
9	1.7	2.4	10.5	2.5	3.7	2.6	.7	.3	1.0	.5	.4	.7
10	1.4	2.3	8.6	2.2	3.6	2.5	.8	.3	.8	.5	.4	.6
11	1.6	2.1	7.3	2.0	3.3	3.1	.8	.3	.7	.4	.4	.7
12	1.7	2.1	5.8	1.9	3.1	4.3	.8	.4	1.1	.4	.4	.7
13	1.7	1.7	6.0	1.8	2.8	4.6	.8	.4	.9	.3	.4	.6
14	1.7	1.5	5.6	1.7	2 6	4.5	1.3	.4	.8	.3	.5	.6
15	1.2	1.7	5.4	1.6	2.4	4.1	1.0	.3	.7	.3	.5	.6
16	1.0	1.7	5.2	1.4	2.3	3.8	.8	.3	.6	.3	.5	.7
17	.9	1.8	4.6	1.3	2.2	4.9	.8	.3	.5	.3	.5	.7
18	1.1	1.5	4.3	1.5	2.0	4.9	1.1	.2	.4	.3	.5	.6
19	1.2	1.5	4.2	4.9	1.9	4.3	1.0	.2	.4	.3	.5	.6
20	2.1	3.1	4.3	6.0	1.9	3.8	1.0	.2	.3	.3	.5	.6
21	6.2	3.8	5.3	6.6	2.0	3.4	.9	.2	.3	.3	.5	.6
22	11.7	4.0	6.4	6.9	2.1	2.9	.8	.2	.3	.3	.5	.6
23	10.8	4.0	6.3	6.4	2.2	2.6	.7	.2	.3	.3	.5	.6
24	8.2	3.5	6.3	6.8	2.1	2.3	.5	.2	.3	.3	.5	.7
25	6.5	5.0	6.4	15.8	2.9	2.1	.5	.2	.3	.3	.5	.6
26	5.2	4.8	6.5	16.9	5.2	1.9	.5	.2	.5	.5	.6	.5
27	4.6	4.3	6.5	14.6	4.8	1.7	.5	.2	1.6	.6	.9	.5
28	4.0	7.8	5.3	10.9	4.3	1.6	.4	.2	2.0	.5	1.2	.5
29	3.5	.....	4.6	8.6	3.8	1.4	.4	.2	2.0	.5	1.4	.7
30	3.2	.....	4.2	7.4	3.4	1.4	.4	.2	1.8	.5	1.4	.9
31	3.0	.....	3.7	.....	3.1	.....	.4	.2	.....	.4	.....	2.6

NOTE.—River frozen over above and below the dam from Jan. 1 to 20, Feb. 7 to 20, and Dec. 13 to 31. Backwater caused by ice also probable Jan. 21 and Feb. 6. River partly open below the dam Feb. 21 to 27, and frozen above the dam at the gage Dec. 7 to 12.

Daily discharge, in second-feet, of West Branch of Susquehanna River at Williamsport, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	500	4,970	88,400	7,780	18,100	6,580	2,410	775	495	2,620	775	2,620
2	550	3,980	88,400	6,870	16,200	6,020	2,210	775	495	1,630	775	3,270
3	700	4,970	82,400	6,300	14,900	5,750	2,210	630	495	1,440	775	2,830
4	700	4,720	71,800	5,750	14,000	5,750	2,210	630	775	1,260	775	2,620
5	600	4,470	57,800	5,490	13,200	5,490	2,010	630	1,820	1,260	775	2,210
6	600	4,000	48,000	5,230	11,900	5,490	1,820	630	2,410	1,090	775	2,010
7	1,000	3,500	58,600	5,230	11,900	5,230	1,630	630	2,830	930	775	1,820
8	1,500	3,200	66,400	5,230	11,500	5,490	1,440	630	2,210	930	775	1,630
9	1,200	3,000	42,200	5,230	8,710	5,490	1,260	630	1,820	930	775	1,260
10	900	2,800	31,200	4,470	8,400	5,230	1,440	630	1,440	930	775	1,090
11	800	2,600	24,400	3,980	7,470	6,870	1,440	630	1,260	775	775	1,260
12	700	2,400	17,200	3,740	6,870	10,800	1,440	775	2,010	775	775	1,260
13	700	2,300	18,100	3,500	6,020	11,900	1,440	775	1,630	630	775	1,090
14	600	2,200	16,200	3,270	5,490	11,500	2,410	775	1,440	630	930	1,090
15	600	2,100	15,400	3,050	4,970	10,000	1,820	630	1,260	630	930	1,090
16	500	2,000	14,500	2,620	4,720	9,030	1,440	630	1,090	630	930	1,260
17	500	2,000	11,900	2,410	4,470	13,200	1,440	630	930	630	930	1,260
18	500	2,000	10,800	2,830	3,980	13,200	2,010	495	775	630	930	1,090
19	1,000	1,800	10,400	13,200	3,740	10,800	1,820	495	775	630	930	1,090
20	3,000	3,000	10,800	18,100	3,740	9,030	1,820	495	630	630	930	1,090
21	19,000	5,000	14,900	20,900	3,980	7,780	1,630	495	630	630	930	1,090
22	50,200	8,000	19,900	22,400	4,220	6,300	1,440	495	630	630	930	1,090
23	44,100	5,000	19,500	19,900	4,470	5,490	1,260	495	630	630	930	1,090
24	29,100	4,000	19,500	21,900	4,220	4,720	930	495	630	630	930	1,260
25	20,400	3,000	19,900	86,400	6,300	4,220	930	495	630	630	930	1,090

Daily discharge, in second-feet, of West Branch of Susquehanna River at Williamsport, Pa., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	14,500	3,000	20,400	97,600	14,500	3,740	930	495	930	930	1,090	950
27	11,900	5,000	20,400	74,600	12,800	3,270	930	495	3,050	1,090	1,630	930
28	9,690	27,000	14,900	44,800	10,800	3,050	775	495	3,980	930	2,210	930
29	8,090	.....	11,900	31,200	9,030	2,620	775	495	3,980	930	2,620	1,260
30	7,170	.....	10,400	24,900	7,780	2,620	775	495	3,500	930	2,620	1,630
31	6,580	.....	8,710	.....	6,870	.....	775	495	.....	775	.....	5,490

NOTE.—Daily discharge determined from a well-defined discharge rating curve. Discharge Jan. 1 to 20 and Feb. 6 to 27 estimated from climatologic records and the discharge at other Susquehanna River stations. No correction made in discharge Jan. 21 or Dec. 7 to 31. Discharge probably not greatly affected by backwater during December, although above figures are probably somewhat excessive.

Monthly discharge of West Branch of Susquehanna River at Williamsport, Pa., for 1910.

[Drainage area, 5,640 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	50,200	[a] 500	7,670	1.36	1.57	C.
February	27,000	[a] 1,800	4,360	.773	.80	C.
March	88,400	8,710	31,100	5.51	6.35	A.
April	97,600	2,410	18,600	3.30	3.68	A.
May	18,100	3,740	8,560	1.52	1.75	A.
June	13,200	2,620	6,890	1.22	1.36	A.
July	2,410	775	1,510	.268	.31	A.
August	775	495	592	.105	.12	A.
September	3,980	495	1,510	.268	.30	A.
October	2,620	630	914	.162	.19	A.
November	2,620	775	1,050	.186	.21	A.
December	5,490	930	1,600	.284	.33	B.
The year	97,600	495	7,060	1.25	16.97	

[a] Estimated.

JUNIATA RIVER AT NEWPORT, PA.

Juniata River rises in the mountains of Bedford, Blair, and Somerset counties, Pa., at a general elevation of about 2,000 feet above the sea, though the divide between its waters and those of the Ohio attains in places an elevation of 2,800 feet. The river has two chief upper divisions, the Frankstown and Raystown branches; from their union, a few miles southeast of Huntingdon, the main river winds eastward to the point where it enters the Susquehanna at Duncans Island. The length of the river below the branches is about 75 miles, and the total drainage area, measured at the mouth, comprises 3,530 square miles.

The gaging station, which is located at the steel highway bridge about 800 feet east of the public square at Newport, about 1 mile below the mouth of Buffalo Creek and about 12 miles above the mouth of the Juniata, was established March 21, 1899, by the United States Geological Survey, and was discontinued from July 15, 1906, to January 6, 1907. It is now being maintained by the Pennsylvania

State Water Supply Commission, from whom the tables of daily gage heights and discharge measurements made by engineers of the commission are obtained.

The datum of the chain gage attached to the bridge has remained constant during the maintenance of the station.

Discharge measurements are made from the bridge.

Conditions of flow are liable to change from year to year. A good discharge rating curve has been developed for high and medium stages, and at low stages it is fairly good.

The gage was checked with a level December 28, 1910, and found correct. No measurement has been made since May 13, 1909. This measurement did not plat well, but determinations of discharge for 1909, derived from the 1908 curve and disregarding the 1909 measurement, compared favorably with the discharge at other stations in the Susquehanna River basin. The discharge for 1910 here published is also obtained from the 1908 curve.

Discharge data for this station prior to 1905 have been revised and republished in Water-Supply Paper 109.

Daily gage height, in feet, of Juniata River at Newport, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.38	3.70	13.05	3.56	5.90	3.70	3.78	2.84	3.02	3.55	2.91	3.15
2	3.30	3.60	13.45	3.56	5.45	3.70	3.62	2.84	3.10	3.28	2.78	3.12
3	3.28	3.52	13.30	3.55	5.05	4.10	3.50	2.78	3.12	3.15	2.98	3.10
4	3.30	3.60	11.20	3.45	4.85	4.35	3.48	2.80	3.25	3.10	2.80	3.00
5	3.30	3.60	9.40	3.45	4.60	4.05	3.40	2.79	3.50	3.00	2.82	3.08
6	3.88	3.75	8.40	3.50	4.40	4.60	3.35	2.82	3.85	2.90	2.88	3.05
7	4.00	3.00	8.20	3.60	4.22	4.85	3.36	2.82	3.85	2.80	2.84	3.02
8	5.05	3.45	8.00	3.50	4.20	4.60	3.41	2.85	3.72	2.80	2.85	3.30
9	5.78	3.59	7.00	3.40	4.15	4.45	3.32	2.88	3.50	3.00	2.76	3.30
10	5.40	3.66	6.10	3.40	4.55	4.40	3.31	2.88	3.40	3.00	2.84	3.30
11	4.65	3.91	5.55	3.35	4.40	5.45	3.28	3.02	3.28	3.00	2.85	3.20
12	4.35	3.82	5.15	3.24	4.15	7.65	3.20	3.05	3.45	2.80	2.90	3.30
13	4.05	3.66	4.88	3.22	4.02	7.95	3.15	3.02	3.50	2.80	2.90	3.35
14	3.92	3.54	4.70	3.21	3.95	6.85	3.10	2.92	3.50	2.80	2.82	3.15
15	4.20	3.45	4.60	3.14	3.90	5.95	3.10	2.90	3.68	2.80	2.78	3.20
16	4.10	3.40	4.40	3.10	3.82	5.60	3.00	2.91	3.70	2.82	2.75	3.12
17	3.95	4.02	4.40	3.20	3.60	7.50	3.15	2.78	3.40	2.72	2.98	3.15
18	3.95	7.59	4.20	4.00	3.66	7.25	3.20	2.88	3.22	2.85	2.80	3.15
19	4.00	6.00	4.12	6.30	3.55	6.50	3.08	2.89	3.12	2.78	2.79	3.15
20	3.95	5.04	4.10	6.95	3.50	5.60	3.16	2.99	3.09	2.90	2.78	3.22
21	6.60	4.80	3.98	7.00	3.52	5.40	3.10	3.50	3.10	2.82	2.76	3.08
22	13.57	5.98	4.05	6.42	3.70	4.95	3.05	3.05	2.99	2.88	2.76	3.02
23	10.20	8.48	4.02	5.78	3.65	4.65	3.02	3.02	3.02	3.02	2.82	3.20
24	6.45	7.78	3.98	7.00	3.80	4.55	3.00	2.95	3.01	3.18	2.85	3.32
25	5.25	5.74	3.95	11.85	4.42	4.30	3.00	2.95	3.00	3.15	2.78	3.30
26	4.58	5.17	3.90	13.05	4.75	4.05	3.00	2.80	3.09	3.02	2.75	3.40
27	4.42	5.18	3.78	10.55	4.55	3.92	2.92	2.80	3.58	3.02	2.82	3.32
28	4.05	9.30	3.79	8.55	4.25	3.90	3.08	2.75	3.55	2.92	2.90	3.22
29	3.98	.....	3.72	7.10	4.30	4.00	3.00	2.75	3.68	2.98	3.02	3.30
30	4.00	.....	3.68	6.40	4.00	3.85	2.88	2.82	3.70	2.98	2.82	3.50
31	3.89	.....	3.62	.....	3.70	.....	2.95	2.75	.....	2.90	.....	3.60

NOTE.—Relation of gage height to discharge probably affected by ice from Jan. 1 to 20, about Feb. 10 to 27, and about Dec. 8 to 31.

Daily discharge, in second-feet, of Juniata River at Newport, Pa., for 1910.

[Drainage area, 3,480 square miles.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	500	2,240	38,300	1,940	8,570	2,240	2,420	773	1,000	1,920	858	1,190
2	550	2,020	40,400	1,940	7,160	2,240	2,060	773	1,120	1,410	702	1,150
3	600	1,850	39,600	1,920	5,930	3,230	1,810	702	1,150	1,190	949	1,120
4	600	2,020	29,400	1,720	5,340	3,910	1,770	725	1,360	1,120	725	975
5	600	2,020	21,600	1,720	4,610	3,100	1,620	714	1,810	975	749	1,090
6	500	2,360	17,500	1,810	4,050	4,610	1,530	749	2,590	845	821	1,040
7	1,000	975	16,700	2,020	3,550	5,340	1,550	749	2,590	725	773	1,000
8	1,500	1,720	16,000	1,810	3,500	4,610	1,640	785	2,290	725	785	900
9	1,200	2,000	12,300	1,620	3,360	4,190	1,480	821	1,810	975	679	900
10	1,000	2,000	9,210	1,620	4,470	4,050	1,460	821	1,620	975	773	900
11	900	1,800	7,460	1,530	4,050	7,160	1,410	1,000	1,410	975	785	900
12	800	1,700	6,230	1,340	3,360	14,600	1,270	1,040	1,720	725	845	800
13	700	1,500	5,420	1,300	3,020	15,800	1,190	1,000	1,810	725	845	800
14	700	1,400	4,900	1,290	2,840	11,700	1,120	871	1,810	725	749	900
15	600	1,300	4,610	1,180	2,710	8,730	1,120	845	2,200	725	702	900
16	600	1,200	4,050	1,120	2,520	7,620	975	858	2,240	749	668	900
17	500	2,500	4,050	1,270	2,020	14,100	1,190	702	1,620	633	949	800
18	500	3,000	3,500	2,970	2,150	13,200	1,270	821	1,300	785	725	800
19	600	2,500	3,280	9,870	1,920	10,500	1,090	833	1,150	702	714	800
20	1,000	2,500	3,230	12,100	1,810	7,620	1,210	962	1,100	845	702	800
21	10,900	3,000	2,920	12,300	1,850	7,000	1,120	1,810	1,120	749	679	800
22	41,000	5,000	3,100	10,300	2,240	5,630	1,040	1,040	962	821	679	800
23	25,000	8,000	3,020	8,190	2,130	4,760	1,000	1,000	1,000	1,000	749	900
24	10,400	5,000	2,920	12,300	2,470	4,470	975	910	989	1,240	785	1,000
25	6,540	3,000	2,840	32,400	4,110	3,770	975	910	975	1,190	702	1,000
26	4,550	3,000	2,710	38,300	5,040	3,100	975	725	1,100	1,000	668	1,200
27	4,110	4,000	2,420	26,600	4,470	2,760	871	725	1,980	1,000	749	1,000
28	3,100	21,200	2,450	18,100	3,640	2,710	1,090	668	1,920	871	845	1,000
29	2,920	.....	2,290	12,600	3,770	2,970	975	668	2,200	949	1,000	1,000
30	2,970	.....	2,200	10,200	2,970	2,590	821	749	2,240	949	749	1,200
31	2,690	.....	2,060	.....	2,240	.....	910	668	.....	845	.....	1,500

NOTE.—Daily discharge determined from a rating curve well defined above 3,000 second-feet and fairly well defined below. Discharge for periods during which ice was present estimated by means of climatologic records and comparison with records of other Susquehanna River stations.

Monthly discharge of Juniata River at Newport, Pa., for 1910.

[Drainage area, 3,480 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	41,000	[a] 500	4,170	1.20	1.38	A.
February	21,200	975	3,240	.931	.97	A.
March	40,400	2,060	10,200	2.93	3.38	A.
April	38,300	1,120	7,780	2.24	2.50	A.
May	8,570	1,810	3,610	1.04	1.20	A.
June	15,800	2,240	6,280	1.80	2.01	A.
July	2,420	821	1,290	.371	.43	C.
August	1,810	668	852	.245	.28	C.
September	2,590	962	1,610	.463	.52	C.
October	1,920	633	938	.270	.31	C.
November	1,000	668	770	.221	.25	D.
December	[a] 1,500	[a] 800	970	.279	.32	C.
The year	41,000	[a] 500	3,470	.997	13.55	

[a] Estimated.

NOTE.—Low accuracy July to December due to probable backwater from fish-trap dams.

POTOMAC RIVER.

GENERAL FEATURES OF AREA DRAINED.

Potomac River is formed by the junction of its North and South branches, about 15 miles below Cumberland, Md., from which it flows in a southeasterly direction into Chesapeake Bay. For its entire length it forms the southern boundary of the State of Maryland and the northern boundary of the States of West Virginia and Virginia. It drains a total area of about 14,500 square miles.

North Branch of Potomac River rises in the Allegheny Mountains near the west corner of Maryland, and South Branch in the Alleghenies in Virginia and West Virginia. These branches with their tributaries and the tributaries of the main stream as far down as the Shenandoah drain a series of narrow and generally fertile valleys lying between the parallel ranges which make up the system of the Alleghenies in this region. Their slopes are not, as a rule, very great, and their beds are of gravel and sand. The slopes of their drainage basins, however, are usually very steep, and after a rain the water collects quickly in the rivers. There are few lowlands to be overflowed and no lakes whatever in the region; consequently these streams, and with them Potomac River, are subject to sudden and very heavy freshets in wet seasons, and in dry seasons their discharge becomes small.

The slopes of the tributary basin of Shenandoah River are in many places steep, but the valley through which the Shenandoah flows is in general broader and more lands are subject to overflow. The slope of the river itself is, as a rule, greater than the slope of the tributaries above mentioned.

From the junction of its North and South branches below Cumberland, Md., the Potomac cuts through the mountains at nearly right angles. Its valley is narrow, its slope in many places great. The bed is generally gravel and bowlders, with ledge rock at little depth, or in places appearing at the surface. The banks are usually high and are not subject to overflow. It crosses the fall line a few miles above Washington and reaches tidewater at Georgetown.

The Baltimore & Ohio Railroad follows the river for most of its length above Washington, and the Norfolk & Western and Cumberland Valley railroads cross the stream. The Chesapeake & Ohio Canal follows it from Cumberland to Georgetown.

As a water-power stream the principal disadvantage of the Potomac is the great variability of its flow. Good rock foundations for dams can generally be found at small depth; the banks are, as a rule, favorable; and there are several sites where large falls could be rendered available. A very insignificant amount of power has been developed.

The Great Falls of the Potomac, located about 15 miles above Washington, offers one of the best undeveloped power sites along Potomac River.

The surface water resources of the Potomac River basin have been discussed in detail in Water-Supply Paper 192.

POTOMAC RIVER AT POINT OF ROCKS, MD.

This station, which is located at the steel highway bridge at Point of Rocks, Md., was established February 17, 1895.

Catoctin Creek enters Potomac River about one-third mile above the station from the Virginia side. Monocacy River enters from the Maryland side about 6 miles below the station. The Chesapeake & Ohio Canal parallels the Potomac on the Maryland side. The average discharge of the canal approximates from 75 to 100 second-feet and is not included in the discharge given in the following tables. The records obtained at Point of Rocks, in conjunction with those derived from stations on Monocacy River near Frederick, Md., and on Goose Creek near Leesburg, Va., are of particular value in determining the discharge available for the development of power at Great Falls, where the Potomac descends about 90 feet in crossing the fall line. The drainage area above these three stations is about 93 per cent of the drainage area at Great Falls. The discharge at Great Falls can be determined without appreciable error by estimating the run-off from the remaining 7 per cent, adding to it the determined discharge at Point of Rocks, at Frederick, and at Leesburg, and then deducting about 101 second-feet per day, the latter amount representing the water taken out by the Washington Aqueduct immediately above the head of Great Falls on the Maryland side.

The conditions of flow at this station are practically permanent. The discharge is controlled by a rock ledge that extends completely across the river (except in one relatively unimportant channel) a few hundred feet below the station.

The discharge is rarely affected by ice.

The datum of the chain gage, which is attached to the bridge from which measurements are made, has been maintained at a constant elevation since September 2, 1902. Prior to this date the datum was 0.45 foot higher than at present.

The present rating curve is considered very accurate and should require relatively little change in the future.[1]

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[1] Discharge data prior to 1907 have been revised and republished in Water-Supply Paper 192.

Daily gage height, in feet, of Potomac River at Point of Rocks, Md., for 1910.

[Geo. H. Hickman, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.65	2.5	5.4	1.5	3.6	1.65	2.3	1.2	0.80	0.81	0.80	0.85
2	1.6	2.4	7.1	1.5	3.3	1.6	2.4	1.2	.80	.80	.85	.80
3	1.55	2.2	7.0	1.55	3.0	1.65	2.1	1.25	.81	.80	.81	.75
4	1.35	2.1	6.4	1.6	2.7	1.65	2.0	1.3	1.0	.81	.80	.80
5	1.35	2.2	5.1	1.65	2.4	1.6	2.0	1.4	1.35	.76	.80	.85
6	3.8	2.0	4.6	1.6	2.2	1.8	2.4	1.25	1.3	.80	.82	1.05
7	3.5	2.1	4.0	1.6	2.1	1.75	2.4	1.2	1.2	.76	.77	1.05
8	3.0	2.4	3.7	1.55	2.0	1.7	2.3	1.1	1.15	.85	.76	.95
9	3.3	2.2	3.4	1.55	2.0	1.7	2.6	1.05	1.05	.86	.70	.95
10	3.2	2.1	3.2	1.5	1.95	1.9	2.4	1.0	.96	.80	.81	1.05
11	3.2	2.2	3.0	1.45	1.95	2.1	2.2	.95	.92	.85	.80	1.0
12	3.0	1.8	2.7	1.4	1.95	4.2	2.2	.92	.90	.91	.80	1.0
13	2.6	1.85	2.3	1.4	1.9	6.3	2.3	.91	.90	.85	.75	1.05
14	2.5	1.95	2.3	1.35	1.85	6.8	2.4	.91	.91	.90	.72	1.0
15	2.3	2.0	2.2	1.3	1.8	6.1	2.6	.95	.91	.85	.75	1.0
16	2.4	2.2	2.2	1.3	1.75	5.9	2.4	1.0	.90	.80	.76	1.0
17	2.4	3.3	2.2	1.4	1.7	15.3	2.4	1.05	.90	.81	.80	1.05
18	2.4	8.2	2.2	1.65	1.7	22.0	2.2	.95	.90	.76	.81	1.0
19	4.0	8.6	2.1	4.3	1.65	13.5	2.2	.91	.85	.75	.72	.95
20	4.0	7.0	2.0	4.8	1.65	13.2	3.0	.90	.75	.80	.70	1.0
21	8.0	5.6	1.95	4.5	1.65	10.4	2.3	.91	.80	.80	.75	1.5
22	13.5	4.1	1.9	4.1	1.85	6.9	2.2	.92	.80	.85	.75	1.35
23	10.5	7.8	1.85	3.8	1.75	6.4	2.0	.91	.75	.80	.72	1.15
24	7.2	7.0	1.8	3.5	1.7	4.9	1.75	.91	.76	.75	.70	1.1
25	4.7	5.2	1.75	3.8	1.85	4.0	1.6	.90	.75	.85	.80	1.1
26	3.7	4.0	1.65	7.6	2.2	3.6	1.55	.90	.55	1.05	.95	1.2
27	3.1	3.6	1.6	7.4	2.9	3.4	1.55	.90	.80	.95	.85	1.1
28	3.0	3.65	1.5	6.8	2.4	2.8	1.55	.85	.85	.90	.80	1.05
29	3.0	.....	1.5	4.9	2.1	2.6	1.6	.80	.80	.85	.81	1.05
30	3.0	.....	1.5	4.1	1.9	2.5	1.25	.80	.80	.80	.81	1.1
31	2.8	.....	1.5	.....	1.75	.....	1.25	.81	.....	.81	.....	1.2

NOTE.—The river above and below the gage was covered with heavy ice from Jan. 1 to 20. Probably no effect from ice during the remainder of January or February. Slight backwater from ice occasionally during December. All gage readings are probably to water surface.

Daily discharge, in second-feet, of Potomac River at Point of Rocks, Md., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,200	6,920	22,300	3,390	12,000	3,860	6,130	2,520	1,480	1,510	1,480	1,610
2	2,200	6,520	33,500	3,390	10,500	3,700	6,520	2,520	1,480	1,480	1,610	1,480
3	2,200	5,750	32,800	3,540	9,070	3,860	5,380	2,660	1,510	1,480	1,510	1,360
4	2,200	5,380	28,800	3,700	7,750	3,860	5,020	2,800	1,990	1,510	1,480	1,480
5	2,200	5,750	20,400	3,860	6,520	3,700	5,020	3,090	2,940	1,390	1,480	1,610
6	5,000	5,020	17,400	3,700	5,750	4,330	6,520	2,660	2,800	1,480	1,540	2,120
7	5,000	5,380	14,100	3,700	5,380	4,170	6,520	2,520	2,520	1,390	1,410	2,120
8	5,000	6,520	12,500	3,540	5,020	4,010	6,130	2,250	2,380	1,610	1,390	1,860
9	10,000	5,750	11,000	3,540	5,020	4,010	7,330	2,120	2,120	1,640	1,240	1,860
10	3,000	5,380	10,000	3,390	4,840	4,670	6,520	1,990	1,890	1,480	1,510	2,120
11	3,000	5,750	9,070	3,240	4,840	5,380	5,750	1,860	1,790	1,610	1,480	1,990
12	2,500	4,330	7,750	3,090	4,840	15,200	5,750	1,790	1,740	1,760	1,480	1,990
13	2,500	4,500	6,130	3,090	4,670	28,100	6,130	1,760	1,740	1,610	1,360	2,120
14	2,500	4,840	6,130	2,940	4,500	31,500	6,520	1,760	1,760	1,740	1,290	1,990
15	2,500	5,020	5,750	2,800	4,330	26,800	7,330	1,860	1,760	1,610	1,360	1,990
16	2,300	5,750	5,750	2,800	4,170	25,500	6,520	1,990	1,740	1,480	1,390	1,990
17	2,300	10,500	5,750	3,090	4,010	99,600	6,520	2,120	1,740	1,510	1,480	2,120
18	2,300	41,500	5,750	3,860	4,010	155,000	5,750	1,860	1,740	1,390	1,510	1,990
19	3,000	44,500	5,380	15,700	3,860	84,600	5,750	1,760	1,610	1,360	1,290	1,860
20	5,000	32,800	5,020	18,600	3,860	82,200	9,070	1,740	1,360	1,480	1,240	1,990
21	40,000	23,600	4,840	16,800	3,860	58,900	6,130	1,760	1,480	1,480	1,360	3,390
22	84,600	14,600	4,670	14,600	4,500	32,100	5,750	1,790	1,480	1,610	1,360	2,940
23	59,800	38,500	4,500	13,000	4,170	28,800	5,020	1,760	1,360	1,480	1,290	2,380
24	34,200	32,800	4,330	11,500	4,010	19,200	4,170	1,760	1,390	1,360	1,240	2,250
25	18,000	21,100	4,170	13,000	4,500	14,100	3,700	1,740	1,360	1,610	1,480	2,250

Daily discharge, in second-feet, of Potomac River at Point of Rocks, Md., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	12,500	14,100	3,860	37,100	5,750	12,000	3,540	1,740	900	2,120	1,860	2,520
27	9,530	12,000	3,700	35,600	8,620	11,000	3,540	1,740	1,480	1,860	1,610	2,250
28	9,070	12,200	3,390	31,500	6,520	8,180	3,540	1,610	1,610	1,740	1,480	2,120
29	9,070	.....	3,390	19,200	5,380	7,330	3,700	1,480	1,480	1,610	1,510	2,120
30	9,070	.....	3,390	14,600	4,670	6,920	2,660	1,480	1,480	1,480	1,510	2,250
31	8,180	.....	3,390	.....	4,170	.....	2,660	1,510	.....	1,510	.....	2,520

NOTE.—Daily discharge determined from a well-defined discharge rating curve. Discharge for Jan. 1 to 20 estimated from climatological records. No correction has been made to the discharge for December.

Monthly discharge of Potomac River at Point of Rocks, Md., for 1910.

[Drainage area, 9,650 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	84,600	[a] 2,200	11,700	1.21	1.40	B.
February	44,500	4,330	12,200	1.26	1.31	B.
March	33,500	3,390	9,960	1.03	1.19	A.
April	37,100	2,800	10,100	1.05	1.17	A.
May	12,000	3,860	5,520	.572	.66	A.
June	155,000	3,700	26,400	2.74	3.06	A.
July	9,070	2,660	5,500	.570	.66	A.
August	3,090	1,480	2,000	.207	.24	A.
September	2,940	900	1,740	.180	.20	A.
October	2,120	1,360	1,560	.162	.19	A.
November	1,860	1,240	1,440	.149	.17	A.
December	3,390	1,360	2,090	.217	.25	B.
The year	155,000	900	7,450	.772	10.50	

[a] Estimated.

MONOCACY RIVER NEAR FREDERICK, MD.

This station, which is located at the county bridge on the toll road leading from Frederick to Mount Pleasant, Md., was established August 4, 1896. It is about 3½ miles northeast of Frederick, 3,000 feet below Tuscarora Creek, which enters on the right, and 2,000 feet above Israel Creek, which enters on the left. Monocacy River is the principal stream entering the Potomac between the Point of Rocks station and Great Falls. (See Potomac River at Point of Rocks.)

The datum of the chain gage attached to the bridge has been maintained unchanged since the establishment of the station.

Discharge measurements are made from the bridge or by wading. The discharge is liable to be more or less affected by ice during the winter months.

Conditions of flow at this station change somewhat from year to year, and changes in the rating curves are therefore necessary.[1]

No measurement was made during 1910.

[1] Discharge data prior to 1907 have been revised and republished in Water-Supply Paper No. 192.

Daily gage height, in feet, of Monocacy River near Frederick, Md., for 1910.

[E. L. Derr, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.3	4.9	12.9	4.3	6.1	4.4	4.6	3.9	3.7	3.7	3.8	4.0
2	4.3	4.5	9.1	4.4	5.7	4.3	4.5	4.0	3.8	3.6	3.9	4.0
3	4.3	4.6	8.5	4.4	5.4	4.4	4.6	3.9	4.4	3.6	3.8	4.0
4	4.3	4.6	7.0	4.5	5.4	5.0	4.5	3.9	4.2	3.54	4.0	4.1
5	4.3	4.6	6.5	4.7	5.2	4.9	4.6	3.8	4.0	3.6	3.9	4.0
6	4.5	5.4	6.1	4.6	5.1	4.8	4.5	3.9	4.1	3.54	4.0	4.3
7	5.25	5.1	6.1	4.4	4.9	4.7	4.4	3.8	3.9	3.54	4.1	4.2
8	7.8	5.2	5.7	4.5	5.0	4.7	4.4	3.9	4.0	3.6	3.9	4.3
9	5.5	5.4	5.4	4.4	5.1	4.8	4.3	3.8	3.9	3.54	4.0	4.1
10	5.3	5.4	5.3	4.3	5.0	5.6	4.4	3.9	3.9	3.6	3.9	4.1
11	5.2	5.4	5.3	4.3	4.8	7.85	4.4	3.8	3.6	3.8	3.9	4.0
12	4.9	5.3	5.3	4.3	4.9	7.45	4.3	3.9	3.7	3.7	4.0	4.1
13	4.9	5.4	5.1	4.1	4.7	7.5	5.7	3.8	3.6	3.8	3.9	4.0
14	4.8	5.2	5.1	4.2	4.8	6.8	5.5	3.9	3.7	3.7	4.0	4.0
15	4.8	4.8	5.0	4.2	4.7	5.9	5.2	5.5	3.7	3.7	3.8	4.0
16	4.9	4.9	4.8	4.1	4.6	6.2	4.3	6.8	3.8	3.6	3.8	4.0
17	4.8	13.4	4.8	4.5	4.7	13.2	4.2	5.8	3.7	3.6	3.8	3.9
18	5.8	15.55	4.7	8.0	4.7	8.7	4.8	4.1	3.8	3.7	3.9	4.0
19	13.65	7.6	4.6	6.95	4.6	6.8	4.5	4.0	3.8	3.7	3.7	3.9
20	9.3	8.6	4.7	6.2	4.6	6.8	4.5	4.1	3.8	3.8	3.7	3.9
21	15.5	11.6	4.7	6.0	4.6	6.4	4.3	4.0	3.6	3.7	3.8	3.9
22	17.8	13.1	4.7	5.9	4.6	6.0	4.2	4.0	3.7	3.9	3.7	4.1
23	8.2	12.1	4.7	6.0	4.6	6.0	4.2	3.9	3.6	4.0	3.9	4.0
24	7.05	8.5	4.6	8.7	4.6	5.3	4.1	4.0	3.7	4.0	3.8	4.1
25	6.4	6.8	4.6	15.3	4.5	5.0	4.1	3.9	3.6	4.0	3.8	4.0
26	5.4	6.3	4.6	9.9	4.7	4.9	4.0	3.9	3.7	3.9	3.9	4.0
27	5.3	5.9	4.5	8.2	4.7	4.8	3.9	3.7	3.6	3.9	3.8	4.1
28	5.2	8.9	4.5	7.0	4.4	4.9	4.0	3.8	3.7	4.0	3.9	4.2
29	5.2	.....	4.4	6.5	4.5	4.8	3.9	3.7	3.6	3.9	4.2	4.1
30	5.0	.....	4.5	6.4	4.4	4.7	4.0	3.8	3.7	4.0	4.1	4.5
31	5.0	.....	4.45	.....	4.3	.....	4.0	3.8	.....	3.8	.....	4.8

NOTE.—Relation of gage height to discharge more or less affected by ice from Jan. 1 to 18. Probably no appreciable backwater from ice during the remainder of the year. All gage readings probably to water surface.

Daily discharge, in second-feet, of Monocacy River near Frederick, Md., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	150	402	7,440	183	1,030	214	282	79	38	38	57	102
2	150	247	3,620	214	789	183	247	102	57	22	79	102
3	150	282	3,050	214	632	214	282	79	214	22	57	102
4	150	282	1,700	247	632	446	247	79	154	15	102	127
5	150	282	1,320	320	537	402	282	57	102	22	79	102
6	200	632	1,030	282	491	360	247	79	127	15	102	183
7	560	491	1,030	214	402	320	214	57	79	15	127	154
8	2,400	537	789	247	446	320	214	79	102	22	79	183
9	682	632	632	214	491	360	183	57	79	15	102	127
10	584	632	584	183	446	734	214	79	79	22	79	127
11	537	632	584	183	360	2,440	214	57	22	57	79	102
12	402	584	584	183	402	2,090	183	79	38	38	102	127
13	402	632	491	127	320	2,130	789	57	22	57	79	102
14	360	537	491	154	360	1,540	682	79	38	38	102	102
15	360	360	446	154	320	906	537	682	38	38	57	102
16	402	402	360	127	282	1,100	183	1,540	57	22	57	102
17	360	7,970	360	247	320	7,760	154	846	38	22	57	79
18	846	10,200	320	2,580	320	3,240	360	127	57	38	79	102
19	8,230	2,220	282	1,660	282	1,540	247	102	57	38	38	79
20	3,810	3,140	320	1,100	282	1,540	247	127	57	57	38	79
21	10,200	6,100	320	969	282	1,240	183	102	22	38	57	79
22	12,600	7,660	320	906	282	969	154	102	38	79	38	127
23	2,760	6,600	320	969	282	969	154	79	22	102	79	102
24	1,750	3,050	282	3,240	282	584	127	102	38	102	57	127
25	1,240	1,540	282	9,960	247	446	127	79	22	102	57	102

Daily discharge, in second-feet, of Monocacy River near Frederick, Md., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	632	1,170	282	4,400	320	402	102	79	38	79	79	102
27	584	906	247	2,760	320	360	79	38	22	79	57	127
28	537	3,430	247	1,700	214	402	102	57	38	102	79	154
29	537	.....	214	1,320	247	360	79	38	22	79	154	127
30	446	.....	247	1,240	214	320	102	57	38	102	127	247
31	446	.....	230	.....	183	.....	102	57	.....	57	.....	360

NOTE.—Daily discharge determined from a fairly well-defined discharge rating curve. Discharge Jan. 1 to 6 slightly reduced on account of effect of ice. No further corrections made to the daily discharge.

Monthly discharge of Monocacy River near Frederick, Md., for 1910.

[Drainage area, 660 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	12,600	[a] 150	1,700	2.58	2.97	B.
February	10,200	247	2,200	3.33	3.47	B.
March	7,440	214	917	1.39	1.60	A.
April	9,960	127	1,210	1.83	2.04	A.
May	1,030	183	388	.588	.68	A.
June	7,760	183	1,130	1.71	1.91	A.
July	789	79	236	.358	.41	A.
August	1,540	38	169	.256	.30	A.
September	214	22	58.5	.089	.10	B.
October	102	15	49.5	.075	.09	B.
November	154	38	77.8	.118	.13	B.
December	360	79	127	.192	.22	B.
The year	12,600	15	676	1.02	13.92	

[a] Estimated; affected by ice.

GOOSE CREEK NEAR LEESBURG, VA.

Goose Creek, the largest and most important tributary of the Potomac between the mouth of the Monocacy and Great Falls, rises on the eastern slope of the Blue Ridge in Loudoun and Fauquier counties, Va., flows eastward, and discharges into the Potomac near Edwards Ferry, Md., about 18 miles above Great Falls. The drainage area comprises about 384 square miles and lies chiefly in Loudoun County.

The gaging station, which is located at Evergreen Mills, about 7 miles directly south of Leesburg, Va., the most convenient railroad station, and about 10 miles above the mouth of the stream, was established July 12, 1909. Little River enters Goose Creek about 1 mile above the station, and Sycoline and Tuscarora creeks enter below.

A vertical staff gage is spiked to a tree on the left bank immediately below the tailrace of the grist and lumber mill.

Measurements are made between the mill and dam, either by wading or from the highway bridge.

The dam is constructed of timber and rock, and at low stages most of the water passes through it. The mill race carries water at all times—three or four times more when the mill is running than when it is idle. This variation in flow causes variation in the gage heights, ranging from a few hundredths to about 0.15 foot, but as the mill is run only four or five hours a day, the fluctuation has a relatively small effect on the accuracy of the estimates.

Discharge measurements of Goose Creek near Leesburg, Va., in 1910.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 22	G. C. Stevens	4.42	[a] 1,330
25	do	2.23	[b] 451
25	do	2.16	[b] 447

[a] Includes 40 second-feet; estimated quantity flowing in the canal.
[b] Includes 28.0 second-feet flowing in mill race.

NOTE.—Measurements made from the bridge.

Daily gage height, in feet, of Goose Creek near Leesburg, Va., for 1910.

[J. O. Daniel, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.08	1.60	4.60	1.10	1.54	1.06	1.28	0.70	0.42	0.10	0.70	0.95
2	1.10	1.58	3.10	1.00	1.40	1.04	1.30	.65	.48	.12	.65	.95
3	1.10	1.50	2.85	1.05	1.38	1.10	1.24	.60	.50	.10	.70	.94
4	1.08	1.95	2.36	1.10	1.55	1.20	1.48	.65	.60	.08	.68	.95
5	1.10	1.85	2.25	1.30	1.35	1.30	1.50	.62	.70	.06	.70	1.00
6	1.10	1.90	2.20	1.30	1.30	1.40	1.28	.64	.66	.10	.65	1.10
7	3.30	1.98	2.05	1.20	1.28	1.38	1.15	.66	.65	.12	.70	1.10
8	2.00	1.52	2.02	1.20	1.10	1.36	1.22	.68	.62	.14	.68	1.05
9	1.80	1.50	1.95	1.20	1.02	1.30	1.35	.55	.60	.20	.70	1.05
10	1.30	1.50	1.90	1.15	.95	2.00	1.34	.60	.61	.40	.75	1.05
11	1.25	1.45	1.85	1.15	.94	2.40	1.30	.65	.62	.50	.77	1.05
12	1.10	1.50	1.88	1.10	1.30	3.00	1.88	.68	.65	.45	.75	1.05
13	1.10	1.30	1.82	1.08	1.32	2.65	2.06	.70	.66	.40	.72	1.05
14	1.08	1.32	1.73	1.05	1.28	2.10	1.38	.65	.60	.45	.75	1.05
15	1.10	3.30	1.64	1.05	1.15	1.80	1.12	.64	.50	.40	.70	1.10
16	1.15	4.50	1.55	1.08	1.12	6.00	1.10	.80	.40	.40	.75	1.10
17	1.20	4.51	1.50	2.00	1.10	3.08	1.05	.92	.30	.45	.85	1.10
18	1.25	6.51	1.40	2.70	1.08	3.02	1.04	.95	.25	.40	.86	1.10
19	7.00	3.40	1.38	2.50	1.04	3.00	1.06	.96	.20	.38	.90	1.10
20	3.00	3.35	1.39	2.00	1.02	2.30	1.10	.94	.20	.40	.88	1.10
21	6.00	3.25	1.38	1.90	1.04	2.10	1.05	.82	.22	.50	.85	1.10
22	4.70	3.87	1.38	1.80	1.06	2.04	.98	.75	.20	.70	.90	1.00
23	3.75	3.52	1.37	1.54	1.20	1.85	1.00	.70	.18	1.00	.92	1.05
24	3.05	2.90	1.32	2.36	1.12	1.74	.98	.65	.15	1.50	.95	1.05
25	2.20	2.71	1.32	3.00	1.44	1.50	.94	.62	.14	1.10	1.10	1.10
26	1.80	2.67	1.33	2.50	1.30	1.45	.90	.64	.12	.95	.98	1.10
27	1.70	3.70	1.33	2.20	1.22	1.38	.92	.55	.13	.75	1.00	1.15
28	1.70	4.10	1.32	1.90	1.10	2.15	.90	.50	.15	.70	1.05	1.25
29	1.68	.....	1.30	1.60	1.12	1.85	.88	.48	.10	.65	1.08	1.25
30	1.75	.....	1.24	1.55	1.10	1.48	.80	.40	.12	.70	1.00	1.90
31	1.70	.....	1.20	.....	1.08	.....	.75	.38	.....	.60	.....	1.90

NOTE.—Relation of gage height to discharge probably affected by ice from about Jan. 1 to 6 and 12 to 18, for short periods during the first half of February, and from about Dec. 5 to 24.

Daily discharge, in second-feet, of Goose Creek near Leesburg, Va., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	240	1,410	106	222	97	150	36	12	2.0	36	74
2	.....	234	783	84	182	93	155	30	16	2.4	30	74
3	.....	210	684	95	177	106	140	25	17	2.0	36	73
4	.....	353	499	106	225	130	204	30	25	1.8	34	74
5	.....	320	459	155	168	155	210	27	36	1.6	36	.....
6	.....	336	441	155	155	182	150	29	32	2.0	30	.....
7	863	363	388	130	150	177	118	32	30	2.4	36	.....
8	370	216	377	130	106	171	135	34	27	2.8	34	.....
9	303	210	353	130	88	155	168	21	25	4.0	36	.....
10	155	210	336	118	74	370	166	25	26	11	42	.....
11	142	196	320	118	73	513	155	30	27	17	45	.....
12	106	210	329	106	155	743	329	34	30	14	42	.....
13	106	155	310	102	160	607	391	36	32	11	39	.....
14	102	160	281	95	150	405	177	30	25	14	42	.....
15	106	863	252	95	118	303	111	29	17	11	36	.....
16	118	1,370	225	102	111	2,040	106	49	11	11	42	.....
17	130	1,370	210	370	106	775	95	69	7.0	14	57	.....
18	142	2,270	182	626	102	751	93	74	5.5	11	59	.....
19	2,490	903	177	550	93	743	97	76	4.0	10	65	.....
20	743	883	179	370	88	477	106	73	4.0	11	62	.....
21	2,040	843	177	336	93	405	95	52	4.6	17	57	.....
22	1,460	1,100	177	303	97	384	80	42	4.0	36	65	.....
23	1,050	952	174	222	130	320	84	36	3.6	84	69	.....
24	763	704	160	499	111	284	80	30	3.0	210	74	.....
25	441	630	160	743	193	210	73	27	2.8	106	106	106
26	303	615	163	550	155	196	65	29	2.4	74	80	106
27	271	1,030	163	441	135	177	69	21	2.6	42	84	118
28	271	1,200	160	336	106	423	65	17	3.0	36	95	142
29	265	.....	155	240	111	320	62	16	2.0	30	102	142
30	287	.....	140	225	106	204	49	11	2.4	36	84	336
31	271	.....	130	.....	102	.....	42	10	.....	25	.....	336

NOTE.—Daily discharge determined from a rating curve well defined between 50 and 1,370 second-feet. Discharge Jan. 1 to 6 and Dec. 5 to 24 estimated from climatologic data. No correction was made to determinations of discharge for the remainder of the year.

Monthly discharge of Goose Creek near Leesburg, Va., for 1910.

[Drainage area, 338 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,490	.....	439	1.30	1.50	B.
February	2,270	155	648	1.92	2.00	B.
March	1,410	130	321	.950	1.10	B.
April	743	84	255	.754	.84	B.
May	225	73	130	.385	.44	B.
June	2,040	93	397	.117	.13	B.
July	391	42	130	.385	.44	B.
August	76	10	34.8	.103	.12	C.
September	36	2.0	14.6	.043	.05	C.
October	210	1.6	27.5	.081	.09	C.
November	106	30	55.2	.164	.18	B.
December	336	.....	89.7	.265	.30	D.
The year	2,490	1.6	208	.615	7.19	

NOTE.—Mean discharge Jan. 1–6 estimated 50 second-feet.
Mean discharge Dec. 5–24 estimated 60 second-feet.

RAPPAHANNOCK RIVER.

RAPPAHANNOCK RIVER NEAR FREDERICKSBURG, VA.

Rappahannock River rises on the eastern slope of the Blue Ridge, in Rappahannock and Fauquier counties, Va., and takes a general southeasterly course to Chesapeake Bay, into which it discharges at a point about 36 miles from Cape Charles. The length of its course in a straight line is about 132 miles, and its drainage area comprises approximately 2,700 square miles. It crosses the fall line, with considerable fall, at the city of Fredericksburg; below that point it is a sluggish, tidal, navigable stream, spreading out in places to a width of several miles. There are no lakes in the basin, and the flow of the river is exceedingly variable. The bed is generally of rock overlain with gravel and sand, and the banks are in most places high enough to confine the stream except at high freshets. The slope of the stream is not uniform but is broken by falls at several places. At Fredericksburg the elevation of the river above sea level is zero; 35½ miles above it is 252 feet, showing a fall of 7.1 feet per mile. The average annual rainfall in this basin is about 42 inches. The principal tributary is the Rapidan, which enters from the right 10 or 12 miles above Fredericksburg and drains about 745 square miles. No important tributary enters between the mouth of the Rapidan and Fredericksburg.

The gaging station, which was established September 19, 1907, in cooperation with the Fredericksburg Power Co., by which the cable and equipment were furnished, is located about 3½ miles above the city. The records of discharge are important in determining the amount of power available between the station and Fredericksburg. The station is located at a pool a few hundred feet above a rocky control and is about 1½ miles above the dam of the power company. The discharge is probably not affected by backwater, as there is considerable fall between the station and the dam.

The original staff gage was destroyed February 14, 1908, and was replaced on February 20, 1908, by a chain gage under the cable. The datum, which is the same for both gages, has been maintained at a constant elevation.

The discharge is likely to be affected by ice during the winter period.

Conditions of flow at the station are probably permanent. At extreme low water the current is very sluggish and accurate discharge measurements are difficult. A good low-water rating curve has been developed.

The following discharge measurement was made by G. C. Stevens:

September 8, 1910: Width, 447 feet; area of section, 1,580 square feet; gage height, 0.95 foot; discharge, 291 second-feet.

Daily gage height, in feet, of Rappahannock River near Fredericksburg, Va., for 1910.

[J. W. Franklin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.16	1.76	4.38	1.47	2.14	1.40	1.73	1.27	0.97	0.60	1.08	1.33
2	1.12	1.68	3.85	1.45	2.10	1.36	1.59	1.23	1.07	.62	1.08	1.17
3	1.18	1.78	3.15	1.60	2.02	1.36	1.46	1.63	1.47	.57	1.11	1.10
4	1.64	2.21	2.86	1.85	1.84	1.38	6.49	1.49	1.43	.50	1.18	.98
5	2.04	2.58	2.58	1.96	1.80	1.47	5.15	1.27	1.24	.48	1.16	.98
6	1.46	2.46	2.43	1.76	1.77	2.01	2.90	1.21	1.15	.48	1.08	1.02
7	1.93	1.80	2.33	1.69	1.64	1.93	2.25	1.14	1.06	.62	1.06	1.03
8	3.30	1.86	2.17	1.63	1.69	1.56	2.05	1.63	.97	1.31	1.06	1.18
9	3.69	1.96	2.07	1.52	1.74	1.48	2.05	1.35	.92	2.16	1.03	1.24
10	3.07	1.80	1.97	1.43	1.62	2.40	1.94	1.23	.83	1.94	1.02	1.17
11	2.48	1.74	2.01	1.39	1.60	3.72	2.15	1.13	.80	1.42	.99	1.16
12	2.52	1.53	2.13	1.39	1.61	5.76	2.69	1.27	.78	1.12	1.00	1.15
13	2.38	1.48	2.17	1.41	2.04	5.83	4.25	1.21	.76	1.01	1.00	1.12
14	2.27	1.62	2.01	1.50	2.04	4.48	3.59	1.14	1.04	.96	1.00	1.15
15	2.17	1.72	1.91	1.46	1.78	3.66	2.55	1.12	1.31	.92	1.00	1.18
16	2.30	1.93	1.81	1.41	1.64	3.18	2.13	1.21	1.06	.87	1.02	1.20
17	1.88	2.93	1.77	3.38	1.60	5.50	2.15	1.17	.87	.82	1.03	1.32
18	1.78	6.35	1.75	4.51	1.58	3.90	2.95	1.13	.82	.80	1.00	1.18
19	2.30	3.85	1.69	3.51	1.52	3.34	4.29	1.11	.77	.80	.99	1.22
20	2.32	3.09	1.66	2.95	1.48	3.15	3.08	1.09	.73	.77	.98	1.32
21	2.12	2.70	1.63	2.57	1.68	3.14	2.29	1.07	.72	1.98	.98	1.26
22	5.65	3.42	1.61	2.37	1.65	2.42	2.04	1.19	.72	1.74	1.00	1.18
23	3.65	3.20	1.57	2.17	2.20	2.34	1.84	1.21	.73	3.14	1.00	1.16
24	3.00	2.71	1.57	3.01	1.81	2.14	1.73	1.19	.71	2.16	1.00	1.34
25	2.48	2.42	1.56	2.67	1.80	2.04	1.61	1.17	.70	1.67	1.02	2.34
26	2.38	2.21	1.55	3.11	2.32	1.86	1.57	1.11	.67	1.47	1.02	2.11
27	2.19	2.07	1.49	2.70	1.82	1.80	1.53	1.17	.65	1.37	1.02	1.90
28	2.30	2.20	1.49	2.53	1.68	1.82	1.49	1.15	.64	1.28	1.06	1.86
29	2.50	.....	1.45	2.33	1.58	2.22	1.39	1.11	.62	1.22	1.13	1.84
30	2.15	.....	1.49	2.19	1.42	1.82	1.37	1.03	.62	1.17	1.27	2.74
31	1.92	.....	1.49	.....	1.40	.....	1.32	.99	.....	1.11	.....	2.68

NOTE.—River more or less frozen from about Jan. 1 to 21, Feb. 7 to 15, and Dec. 5 to 29. All gage readings probably to water surface.

Daily discharge, in second-feet, of Rappahannock River near Fredericksburg, Va., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	442	1,060	6,040	718	1,570	645	1,020	526	325	186	388	578
2	414	961	4,760	698	1,520	607	854	494	382	192	388	449
3	456	1,080	3,290	865	1,400	607	708	901	718	178	407	400
4	913	1,680	2,740	1,180	1,160	626	12,300	740	676	160	456	330
5	1,430	2,260	2,260	1,320	1,110	718	8,160	526	502	156	442	330
6	708	2,060	2,010	1,060	1,070	1,390	2,820	478	435	156	388	352
7	1,280	1,110	1,860	973	913	1,280	1,740	428	376	192	376	358
8	3,580	1,190	1,620	901	973	819	1,440	901	325	560	376	456
9	4,400	1,320	1,470	773	1,040	729	1,440	598	300	1,600	358	502
10	3,130	1,110	1,330	676	889	1,960	1,290	494	262	1,290	352	449
11	2,090	1,040	1,390	634	865	4,470	1,590	421	250	666	335	442
12	2,160	784	1,560	634	877	10,000	2,440	526	243	414	340	435
13	1,930	729	1,620	656	1,430	10,200	5,700	478	236	346	340	414
14	1,760	889	1,390	750	1,430	6,300	4,190	428	364	320	340	435
15	1,620	1,010	1,250	708	1,080	4,340	2,210	414	560	300	340	456
16	1,810	1,280	1,120	656	913	3,350	1,560	478	376	278	352	470
17	1,210	2,870	1,070	3,750	865	9,200	1,590	449	278	258	358	569
18	1,080	11,900	1,050	6,380	842	4,870	2,910	421	258	250	340	456
19	1,810	4,760	973	4,020	773	3,670	5,800	407	240	250	335	486
20	1,840	3,170	937	2,910	729	3,290	3,150	394	226	240	330	569
21	1,540	2,460	901	2,240	961	3,270	1,800	382	223	1,350	330	518
22	9,660	3,830	877	1,920	925	2,000	1,430	463	223	1,040	340	456
23	4,320	3,380	830	1,620	1,660	1,870	1,160	478	226	3,270	340	442
24	3,000	2,480	830	3,020	1,120	1,570	1,020	463	219	1,600	340	588
25	2,090	2,000	819	2,410	1,110	1,430	877	449	216	949	352	1,870
26	1,930	1,680	808	3,210	1,840	1,190	830	407	207	718	352	1,530
27	1,650	1,470	740	2,460	1,140	1,110	784	449	201	616	352	1,240
28	1,810	1,660	740	2,170	961	1,140	740	435	198	534	376	1,190
29	2,120	.....	698	1,860	842	1,690	634	407	192	486	421	1,160
30	1,590	.....	740	1,650	666	1,140	616	358	192	449	526	2,530
31	1,270	.....	740	.....	645	.....	569	335	.....	407	.....	2,430

NOTE.—Daily discharge determined from a discharge curve well defined below 6,000 second-feet. No correction has been made for effect of ice, as the gage heights for the periods during which ice existed indicate a relatively small amount of backwater.

Monthly discharge of Rappahannock River near Fredericksburg, Va., for 1910.

[Drainage area, 1,590 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	9,660	414	2,100	1.32	1.52	B.
February	11,900	729	2,190	1.38	1.44	B.
March	6,040	698	1,560	.981	1.13	A.
April	6,380	634	1,760	1.11	1.24	A.
May	1,840	645	1,070	.673	.78	A.
June	10,200	607	2,850	1.79	2.00	B.
July	12,300	569	2,370	1.49	1.72	B.
August	901	335	488	.307	.35	A.
September	718	192	314	.197	.22	A.
October	3,270	156	626	.394	.45	A.
November	526	330	369	.232	.26	A.
December	2,530	330	738	.464	.53	B.
The year	12,300	156	1,360	.862	11.64	

MISCELLANEOUS MEASUREMENTS.

Measurements of stream discharge in north Atlantic coast drainage basins, made at points other than regular gaging stations, are recorded in the following table:

Miscellaneous measurements in north Atlantic coast drainage basins in 1910.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Apr. 21	Baboosic stream	Souhegan River	At mouth, near Merrimac, N. H.	[a] 14.16	110
July 22	Ware River	Chicopee River	Barre Station, Mass.	([b])	102
22	do	do	do	([c])	368
Sept. 13	do	do	do	([d])	7.34
Oct. 15	West Branch of Westfield River.	Westfield River	Highway bridge, Chester, Mass.		33.2
Sept. 8	do	do	Huntington, Mass.		69.1
July 20	The Branch, Niagara Brook.	Schroon River	Farm crossing near White House Hotel, 1 mile west of Blue Ridge, N. Y.	[a] 5.62	12.5
Jan. 10	West Branch of Sacandaga River.	Sacandaga River	Highway bridge above mouth of Devorse Creek, about 2½ miles southwest of Wells, N. Y.		[e] 76.9
Aug. 23	West Stony Creek	do	Near highway bridge on road to Benson Center, N. Y.	[a] 15.69	7.4
23	East Stony Creek	do	300 yards above highway bridge on road to Wells, N. Y.	[a] 12.2	16.1
Aug. 12	Batten Kill	Hudson River	Battenville, N. Y.	[f] 6.35	241
Oct. 23	do	do	do	[f] 5.66	85.6
June 2	Schuyler Creek	do	Highway Bridge at Stillwater, N. Y.	7.9	39
Aug. 1	Hoosic River	do	Highway bridge, Buskirk, N. Y.	[g] 2.27	262
1	do	do	At Eagle Bridge, N. Y.	1.11	233
Oct. 11	do	do	do	.93	153

[a] Reference point to water surface.
[b] Pond gage, 101.62 feet; forebay gage, 101.62 feet; tailrace gage, 86.66 feet.
[c] Pond gage, 101.10 feet; forebay gage, 100.04 feet; tailrace gage, 87.95 feet.
[d] Pond gage, 98.60 feet; tailrace gage, 85.64 feet; reference point on bridge, 18.15 feet.
[e] Measurement made under complete ice cover; average thickness of ice, 0.8 foot.
[f] Gage height referred to chain gage on bridge.
[g] Old chain gage datum; affected by backwater.

SUMMARY OF DISCHARGE PER SQUARE MILE.

The following summary of discharge per square mile is given to allow ready comparison of relative rates of run-off from different areas in the north Atlantic coast drainage basins. It shows in a general way the seasonal distribution of run-off and the effect of snow, ground, surface, and artificial storage; but the most important fact worth noting is the almost entire lack of uniformity or agreement between any two streams. This indicates that the discharge of each stream is a law unto itself, and that all projects dependent upon stream flow, if they are to be developed along the safest and most economical lines, must be based on records of stream flow collected with great care over a long series of years as near the location of the project under consideration as possible.

Summary of discharge, in second-feet per square mile, for stations in north Atlantic coast drainage basins for 1910.

Station.	Drainage area.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
NEW ENGLAND STATES.	*Sq. m.*													
St. John River near Dickey, Maine	2,820	....	....	....	....	....	....	....	0.55	0.37	0.50	....	....	....
St. John River at Fort Kent, Maine	4,880	0.30	0.25	0.66	6.74	3.36	1.77	.38	.54	.49	.43	1.00	0.29	1.35
St. John River at Van Buren Maine	8,270	....	....	....	....	....	2.24	.59	.57	.43	.42	.85	.22	....
Allagash River near Allagash, Maine	1,240	....	....	....	....	....	....	.35	.34	.74	.29	.39	....	....
St. Francis River near St. Francis, Maine	560	....	....	....	....	....	2.20	.61	.56	.29	.34	.85	....	....
Madawaska River at Ste. Rose du Degele, Quebec	958	....	....	....	....	....	2.89	1.10	.75	.43	.43	.93	.91	....
Aroostook River at Fort Fairfield, Maine	2,230	.94	.54	.81	7.40	4.22	2.35	1.32	.30	.22	.19	.59	.16	1.58
St. Croix River near Woodland, Maine	1,420	1.63	1.59	1.89	1.88	1.71	1.86	1.61	1.38	1.40	1.34	.89	.95	1.51
Machias River at Whitneyville, Maine	465	2.60	2.39	3.27	3.81	4.62	2.26	1.54	.61	.52	.37	.31	.63	1.91
Green Lake Stream at Lakewood, Maine	47	2.21	3.23	4.30	3.53	3.19	1.43	1.16	1.20	2.60	1.45	1.00	1.87	2.26
Branch Lake Stream near Ellsworth, Maine	31	1.46	1.80	3.84	3.29	3.61	2.63	1.86	2.42	1.88	1.74	2.01	1.36	2.33
West Branch of Penobscot River at Millinocket, Maine	1,880	1.14	2.16	2.16	1.34	3.03	2.86	1.52	1.23	1.25	1.18	1.14	1.14	1.68
Penobscot River at West Enfield, Maine	6,600	1.12	1.30	1.79	4.21	3.00	2.55	1.27	.93	.64	.51	.62	.61	1.55
East Branch of Penobscot River at Grindstone, Maine	1,100	.97	.54	.60	5.01	3.62	4.43	1.46	.46	.24	.19	.36	.25	1.51
Mattawamkeag River at Mattawamkeag, Maine	1,500	1.20	1.10	1.50	5.38	3.12	2.05	.73	.36	.18	.10	.47	.43	1.38
Piscataquis River near Foxcroft, Maine	286	1.05	1.05	2.82	7.97	2.08	2.41	.46	.51	.28	.14	.14	.43	1.60
Kenduskeag Stream near Bangor, Maine	191	2.82	2.13	5.20	3.10	1.43	.69	.24	.25	.09	.08	.15	.59	1.39
Moose River near Rockwood, Maine	680	....	....	....	....	....	3.37	1.28	.41	.35	.35	.64	.29	....
Kennebec River at The Forks, Maine	1,570	1.27	1.11	.96	2.59	3.81	3.03	2.04	1.55	.89	1.01	.76	.80	1.66
Kennebec River at Bingham, Maine	2,660	1.22	1.09	1.28	3.84	3.75	2.79	....	....	....	....	....	....	....
Kennebec River at Waterville, Maine	4,270	1.30	1.11	2.44	5.22	3.37	2.74	1.26	.99	.59	.60	.59	.45	1.72
Dead River near The Forks, Maine	878	1.14	1.03	1.67	7.18	4.69	2.08	.57	.50	.42	.20	.50	.23	1.67
Sandy River near Farmington, Maine	270	....	....	....	....	....	....	....	.40	.24	.23	.32	.23	....
Sebasticook River at Pittsfield, Maine	320	1.48	1.63	2.48	3.59	1.87	1.08	.83	.85	.64	.41	.38	.31	1.30
Cobbosseecontee Stream at Gardiner, Maine	240	.77	.86	1.15	1.22	1.58	1.01	.86	.94	.94	.81	.70	.46	.94
Androscoggin River at Errol Dam, N. H.	1,095	1.02	1.08	1.05	3.10	2.56	2.52	1.11	1.02	1.08	.90	.94	1.09	1.46
Androscoggin River at Rumford Falls, Maine	2,090	1.28	.94	1.88	4.03	2.11	1.76	.80	.85	.80	.69	.79	.69	1.38
Presumpscot River at outlet of Sebago Lake, Maine	436	1.43	1.47	1.18	1.17	1.17	1.21	1.17	1.19	1.19	1.13	1.09	.82	1.18
Saco River at West Buxton, Maine	1,550	.76	.75	3.65	5.28	3.22	2.00	.67	.76	.60	.46	.66	.51	1.61
Pemigewasset River at Plymouth, N. H.	615	1.93	.86	5.27	6.85	2.70	2.42	.62	1.33	1.12	.69	1.13	.82	2.15
Merrimac River at Franklin Junction, N. H.	1,460	1.40	1.15	3.72	3.98	2.36	1.97	.90	1.01	.80	.76	1.05	.62	1.64
Merrimac River at Garvins Falls, N. H.	2,340	1.23	1.00	3.51	3.26	1.75	1.35	.58	.70	.60	.50	.70	.50	1.31
Merrimac River at Lawrence, Mass.	4,452	1.04	.97	3.61	2.44	1.51	1.08	.40	.46	.40	.30	.46	.34	1.08

Summary of discharge, in second-feet per square mile, for stations in north Atlantic coast drainage basins for 1910—Continued.

Station.	Drainage area.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
NEW ENGLAND STATES—continued.	*Sq. m.*													
Souhegan River at Merrimac, N. H.	168	1.64	1.23	8.33	2.97	1.57	1.35	.25	.24	.21	.24	.37	.35	1.57
South Branch of Nashua River at Clinton, Mass.	118.2	2.86	2.85	4.08	1.60	.94	1.27	.10	.29	.22	.11	.55	.60	1.28
Sudbury River at Framingham, Mass.[a]	75.2	2.30	2.86	3.02	1.03	.43	.80	.16	.11	.01	.08	.27	.34	.88
Lake Cochituate at Cochituate, Mass.[a]	17.8	2.42	2.81	2.41	1.15	.40	1.02	.25	.01	.10	.04	.38	.51	.96
Connecticut River at Orford, N. H.	3,300	.95	.61	3.88	4.39	2.75	1.83	.49	.74	.33	.62	.76	.46	1.50
Connecticut River at Sunderland, Mass.	7,700	1.69	1.08	5.40	3.90	2.27	1.90	.42	.54	.40	.44	.64	.36	1.59
Passumpsic River near St. Johnsbury, Vt.	237	1.91	1.16	4.19	3.89	2.68	1.81	.65	.68	.70	.73	.84	.59	1.66
White River near Sharon, Vt.	686	.79	1.02	4.61	2.64	1.81	2.07	.48	.82	.82	.77	.96	.81	1.47
Deerfield River at Shelburne Falls, Mass.	501	2.99	1.94	7.25	3.69	1.70	2.24	.33	.22	.33	.26	.61	.34	1.82
Westfield River at Knightville, Mass.	162	3.44	1.51	6.91	3.59	1.70	2.31	.28	.23	.59	.15	.91	.53	1.85
Westfield River (Middle Branch), Goss Heights, Mass.	53	....	....	....	....	....	....	....	.25	.59	.14	1.23	.57	....
HUDSON RIVER.														
Hudson River at North Creek, N. Y.	804	.74	.84	4.53	4.43	2.96	2.29	.63	1.19	1.23	1.41	1.13	.71	1.84
Hudson River at Thurman, N. Y.	1,550	.58	.77	4.19	4.39	2.55	2.45	.53	.79	.92	1.03	.96	.56	1.65
Hudson River at Mechanicsville, N. Y.	4,500	1.15	1.22	4.76	3.91	2.05	2.27	.36	.44	.50	.56	.73	.45	1.53
Schroon River at Riverbank, N. Y.	534	.35	.68	3.58	5.21	3.18	2.62	.49	.35	.65	.69	.75	.41	1.58
Sacandaga River at Wells, N. Y.	263	1.40	1.14	6.84	5.40	3.61	3.14	.24	.61	1.17	1.00	1.22	.46	2.19
Sacandaga River at Northville, N. Y.	740	1.22	1.01	7.16	6.22	3.55	3.03	.33	.50	.70	.81	1.15	.47	2.19
Sacandaga River near Hadley, N. Y. (upper bridge station)	1,050	1.07	.97	7.34	5.78	3.37	3.47	.34	.44	.58	.66	1.08	.52	2.14
Sacandaga River at Hadley, N. Y. (lower bridge station)	1,060	....	.96	....	....	....	....	.30	.39	.69	.65	.93	....	....
Schoharie Creek at Prattsville, N. Y.	240	3.32	3.34	5.47	5.81	1.57	2.08	.33	.20	.23	.22	1.30	1.40	2.09
Esopus Creek (weir station) near Olivebridge, N. Y.	239	4.51	2.54	7.13	8.19	1.92	1.70	.38	.27	.42	.20	.61	.88	2.40
Esopus Creek at Mount Marion, N. Y.	378	4.25	1.79	8.01	8.88	2.09	2.01	.39	.28	.35	.20	.54	.39	2.43
Rondout Creek at Rosendale, N. Y.	380	3.56	2.55	7.09	6.09	2.02	1.77	.34	.47	.50	.26	1.08	.84	2.21
MIDDLE ATLANTIC STATES.														
Passaic River near Chatham, N. J.	101	3.50	1.50	5.02	1.22	.58	1.40	.17	.23	.17	.14	.74	.67	1.28
East Branch Delaware River at Hancock, N. Y.	920	2.70	2.04	6.74	3.74	1.91	1.39	.33	.23	.39	.19	.65	.49	1.73
Delaware River at Port Jervis, N. Y.	3,250	1.93	1.20	6.03	2.72	1.67	1.24	.30	.22	.23	.13	.47	.46	1.38
Delaware River at Riegelsville, N. J.	6,430	1.90	1.54	5.30	3.05	1.94	1.41	.49	.37	.39	.26	.55	.48	1.47
West Branch Delaware River at Hancock, N. Y.	680	2.34	1.43	5.87	1.81	1.87	1.43	.25	.12	.18	.09	.46	.43	1.36
Mongaup River near Rio, N. Y.	189	1.62	1.27	4.83	3.23	1.99	1.15	.33	.32	.29	.17	.62	.79	1.39
Lehigh River at South Bethlehem, Pa.	1,235	2.15	2.12	3.80	3.10	2.27	1.64	.63	.39	.46	.29	.57	.63	1.50
Tohickon Creek at Point Pleasant, Pa.	102	6.51	4.66	3.25	3.71	.60	1.15	.05	.30	.74	.70	1.21	1.00	1.91
Neshaminy Creek below forks, Pa.	139	4.27	3.55	2.03	2.43	.78	1.12	.11	.52	.19	.16	.71	.86	1.38
Schuylkill River near Philadelphia, Pa.	1,920	1.62	1.86	2.11	1.45	.94	1.25	.31	.24	.38	.13	.37	.24	.90
Perkiomen Creek near Frederick, Pa.	152	2.73	3.72	2.04	1.78	.76	1.18	.19	.53	.44	.20	.81	.78	1.24
Susquehanna River at Binghamton, N. Y.	2,400	1.57	1.04	6.96	1.47	1.65	1.77	.34	.14	.21	.22	.64	.38	1.40
Susquehanna River at Wilkes-Barre, Pa.	9,810	1.29	.65	5.26	1.74	1.59	1.12	.20	.10	.10	.11	.31	.27	1.07
Susquehanna River at Danville, Pa.	11,100	1.09	.67	5.13	1.88	1.60	1.26	.26	.13	.14	.15	.37	.29	1.09
Susquehanna River at Harrisburg, Pa.	24,000	1.43	.75	4.71	2.36	1.61	1.64	.37	.19	.28	.23	.32	.31	1.19
Chenango River at Binghamton, N. Y.	1,530	1.35	.94	6.46	1.03	1.51	1.23	.20	.18	.33	.30	.88	.42	1.24
Chemung River at Chemung, N. Y.	2,440	.93	.62	4.34	2.65	1.74	.49	.12	.05	.08	.06	.11	.18	.95
West Branch of Susquehanna River at Williamsport, Pa.	5,640	1.36	.77	5.51	3.30	1.52	1.22	.27	.10	.27	.16	.19	.28	1.25
Juniata River at Newport, Pa.	3,480	1.20	.93	2.93	2.24	1.04	1.80	.37	.24	.46	.27	.22	.28	1.00
Potomac River at Point of Rocks, Md.	9,650	1.21	1.26	1.03	1.05	.57	2.74	.57	.21	.18	.16	.15	.22	.77
Monocacy River near Frederick, Md.	660	2.58	3.33	1.39	1.83	.59	1.71	.36	.26	.09	.08	.12	.19	1.02
Goose Creek near Leesburg, Va.	338	1.30	1.92	.95	.75	.38	.12	.38	.10	.04	.08	.16	.26	.62
Rappahannock River near Fredericksburg, Va.	1,590	1.32	1.38	.98	1.11	.67	1.79	1.49	.31	.20	.39	.23	.46	.86

[a] Attention is called to the fact that the Sudbury River records do not give the actual run-off of the river (which would include the effect of storage in the wet season and draft from storage in the dry season from the tributary reservoirs and streams as well as the loss by evaporation from them), but the natural flow of the basin without storage, as nearly as this flow can be measured and adjusted for the change in volume of stored water, without, however, taking into account the actual loss of water by evaporation from the water surfaces of the existing reservoirs and streams in this drainage basin. It may be said that this method of figuring the yield is common for waterworks or public supplies and is used also in the Nashua and Croton records, but for streams utilized chiefly for production of power the effect of storage as well as the loss by evaporation is included in the yield or run-off measurements and records.

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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 282

SURFACE WATER SUPPLY OF THE UNITED STATES

1910

PART II. SOUTH ATLANTIC COAST AND EASTERN GULF OF MEXICO

PREPARED UNDER THE DIRECTION OF M. O. LEIGHTON

BY

M. R. HALL AND J. G. MATHERS

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SURFACE WATER SUPPLY OF THE SOUTH ATLANTIC COAST AND EASTERN GULF OF MEXICO, 1910.

By M. R. Hall and J. G. Mathers.

INTRODUCTION.

AUTHORITY FOR INVESTIGATIONS.

This volume contains results of measurements of the flow of certain streams in the United States. The work was performed by the water-resources branch of the United States Geological Survey, either independently or in cooperation with private or State organizations. The organic law of the Geological Survey (20 Stat. L., p. 394) contains the following paragraph:

Provided, That this officer [the Director] shall have the direction of the geological survey and the classification of public lands and examination of the geological structure, mineral resources, and products of the national domain.

As water is the most abundant and most valuable of the minerals, the investigation of water resources is authorized under the provision for examining mineral resources. The work has been supported since the fiscal year ending June 30, 1895, by appropriations in successive sundry civil bills passed by Congress under the following item:

For gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources.

The various appropriations that have been made for this purpose are as follows:

Annual appropriations for the fiscal year ending June 30—

1895	$12,500
1896	20,000
1897 to 1900, inclusive	50,000
1901 to 1902, inclusive	100,000
1903 to 1906, inclusive	200,000
1907	150,000
1908 to 1910, inclusive	100,000
1911	150,000

SCOPE OF INVESTIGATIONS.

These investigations are not complete nor are they inclusive of all the streams that might purposefully be studied. The scope of the work is limited by the appropriations available. The field covered is the widest and the character of the work is believed to be the best possible under the controlling conditions. The work would undoubtedly have greater scientific importance and ultimately be of more practical value if the money now expended for wide areas were concentrated on a few small drainage basins; but such a course is impossible, because general appropriations made by Congress are applicable to all parts of the country. Each part demands its proportionate share of the benefits.

It is essential that records of stream flow shall be kept during a period of years long enough to determine within reasonable limits the entire range of flow from the absolute maximum to the absolute minimum. The length of such a period manifestly differs for different streams. Experience has shown that the records for some streams should cover five to ten years, and those for other streams 20 years or even more, the limit being determined by the relative importance of the stream and the interdependence of the results with other long-time records on adjacent streams.

In the performance of this work an effort is made to reach the highest degree of precision possible with a rational expenditure of time and a judicious expenditure of a small amount of money. In all engineering work there is a point beyond which refinement is needless and wasteful, and this statement applies with especial force to stream-flow measurements. It is confidently believed that the stream-flow data presented in the publications of the Survey are in general sufficiently accurate for all practical purposes. Many of the records are, however, of insufficient length, owing to the unforeseen reduction of appropriations and consequent abandonment of stations. All persons are cautioned to exercise the greatest care in using such incomplete records.

Records have been obtained at nearly 2,000 different points in the United States. The surface water supply of small areas in Seward Peninsula and the Yukon-Tanana region, Alaska, and in Hawaii has also been investigated. During 1910 regular gaging stations were maintained by the Survey and cooperating organizations at about 1,100 points in the United States, and many discharge measurements were made at other points. Data were also obtained in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in the regular surface water supply papers and in special papers from time to time.

PUBLICATIONS.

The data on stream flow collected by the United States Geological Survey have appeared in the annual reports, bulletins, and water-supply papers. Owing to natural processes of evolution and to changes in governmental requirements, the character of the work and the territory covered by these different publications have varied greatly. For the purpose of uniformity in the presentation of reports a general plan has been agreed upon by the United States Reclamation Service, the United States Forest Service, the United States Weather Bureau, and the United States Geological Survey, according to which the area of the United States has been divided into 12 parts, whose boundaries coincide with certain natural drainage lines. The areas so described are indicated by the following list of papers on surface water supply for 1910. The dividing line between the north Atlantic and south Atlantic drainage areas lies between York and James rivers.

Papers on surface water supply of the United States, 1910.

Part.	No	Title.	Part.	No.	Title.
I	281	North Atlantic coast.	VI	286	Missouri River basin.
II	282	South Atlantic coast and eastern Gulf of Mexico.	VII	287	Lower Mississippi River basin.
III	283	Ohio River basin.	VIII	288	Western Gulf of Mexico.
IV	284	St. Lawrence River basin.	IX	289	Colorado River basin.
V	285	Upper Mississippi River and Hudson Bay basins.	X	290	Great Basin.
			XI	291	California.
			XII	292	North Pacific coast.

The following table gives the character of data regarding stream flow at regular stations to be found in the various publications of the United States Geological Survey, exclusive of special papers:

Stream-flow data in reports of the United States Geological Survey.

[A=Annual Report; B=Bulletin; WS=Water-Supply Paper.]

Report.	Character of data.	Year.
10th A, pt. 2	Descriptive information only	
11th A, pt. 2	Monthly discharge	1884 to Sept., 1890.
12th A, pt. 2	do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
WS 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
WS 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
WS 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
WS 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.
WS 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1896.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
WS 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
WS 47 to 52	Description, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
WS 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
WS 75	Monthly discharge	1901.
WS 82 to 85	Complete data	1902.
WS 97 to 100	do	1903.
WS 124 to 135	do	1904.
WS 165 to 178	do	1905.
WS 201 to 214	Complete data, except descriptions	1906.
WS 241 to 252	Complete data	1907–8.
WS 261 to 272	do	1909.
WS 281 to 292	do	

NOTE.—No data regarding stream flow are given in the 15th and 17th annual reports.

The records at most of the stations discussed in these reports extend over a series of years. An index of the reports containing records prior to 1904 has been published in Water-Supply Paper 119.

The first table which follows gives, by years and drainage basins, the numbers of the papers on surface water supply published from 1899 to 1909. Wherever the data for a drainage basin appear in two papers the number of one is placed in parentheses and the portion of the basin covered by that paper is indicated in the second table. For example, in 1904 the data for Missouri River were published in Water-Supply Papers 130 and 131, and the portion of the records contained in Water-Supply Paper 131, as indicated by the second table, is that relating to Platte and Kansas rivers.

Numbers of water-supply papers containing results of stream measurements, 1899–1910.

	1899 [1]	1900 [2]	1901	1902	1903	1904	1905	1906	1907–8	1909	1910
Atlantic coast and eastern Gulf of Mexico:											
New England rivers	35	47	65, 75	82	97	124	165	201	241	261	281
Hudson River to Delaware River, inclusive	35	47,(48)	65, 75	82	97	125	166	202	241	261	281
Susquehanna River to York River, inclusive	35	48	65, 75	82	97	126	167	203	241	261	281
James River to Yadkin River, inclusive	(35),36	48	65, 75	(82),83	(97),98	126	167	203	242	262	282
Santee River to Pearl River, inclusive	36	48	65, 75	83	98	127	168	204	242	262	282
St. Lawrence River	36	49	65, 75	(82).83	97	129	170	206	244	264	284
Hudson Bay	.....	.....	66, 75	85	100	130	171	207	245	265	285
Mississippi River:											
Ohio River	36	48,(49)	65, 75	83	98	128	169	205	243	263	283
Upper Mississippi River	36	49	65, 75	83	98,(99)	128, (130)	171	207	245	265	283
Missouri River	(36),37	49,(50)	66, 75	84	99	130, (131)	172	208	246	266	286
Lower Mississippi River	37	50	(65), 66, 75	(83),84	(98),99	(128), 131	(169), 173	(205), 209	247	267	287
Western Gulf of Mexico	37	50	66, 75	84	99	132	174	210	248	268	288
Pacific coast and Great Basin:											
Colorado River	(37),38	50	66, 75	85	100	133, (134)	175, (177)	211, (213)	249, (251)	269, (271)	289
Great Basin	38,(39)	51	66, 75	85	100	133, (134)	176, (177)	212, (213)	250, (251)	270, (271)	290
South Pacific coast to Klamath River, inclusive	(38),39	51	66, 75	85	100	134	177	213	251	271	291
North Pacific coast	38	51	66, 75	85	100	135	(177) 178	214	252	272	292

[1] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39.
[2] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52.

Numbers of water-supply papers containing data covering portions of drainage basins.

No.	River basin.	Tributaries included.
35	James	
36	Missouri	Gallatin.
37	Colorado	Green, Gunnison, Grand above junction with Gunnison.
38	Sacramento	Except Kings and Kern.
39	Great Basin	Mohave.
48	Delaware	Wissahickon and Schuylkill.
49	Ohio	Scioto.
50	Missouri	Loup and Platte near Columbus, Nebr. All tributaries below junction with Platte.
65	Lower Mississippi	Yazoo.
82	James	Lake Ontario, tributaries to St. Lawrence River proper.
	St. Lawrence	
83	Lower Mississippi	Yazoo.
97	James	
98	Lower Mississippi	Do.
99	Upper Mississippi	Tributaries from the west.
128	Lower Mississippi	Yazoo.
130	Upper Mississippi	Tributaries from the west.
131	Missouri	Platte, Kans.
134	Colorado	Data near Yuma, Ariz., repeated.
	Great Basin	Susan, Owens, Mohave.
169	Lower Mississippi	Yazoo.
177	Colorado	Below junction with Gila.
	Great Basin	Susan repeated, Owens, Mohave.
	North Pacific coast	Rogue, Umpqua, Siletz.
205	Lower Mississippi	Yazoo, Homochitto.
213	Colorado	Data at Hardyville repeated; at Yuma, Salton Sea.
	Great Basin	Owens, Mohave.
251	Colorado	Yuma and Salton Sea stations repeated.
271	Great Basin	Owens River Basin.

The order of treatment of stations in any basin in these papers is downstream. The main stem of any river is determined by measuring or estimating the drainage area; that is, the headwater stream having the largest drainage area is considered the continuation of the main stream and local changes in name and lake surface are disregarded. Records for all stations from the source to the mouth of the main stem of the river are presented first, and records for the tributaries in regular order from source to mouth follow, all records in each tributary basin being given before those of the next basin below.

The exceptions to this rule occur in the records for Mississippi River, which are given in four parts, as indicated above, and in the records for large lakes, where it is simpler to take up the streams in regular order around the rim of the lake than to cross back and forth over the lake surface.

DEFINITION OF TERMS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and run-off in second-feet per square mile, and (2) those which represent the actual quantity of water, as run-off in depth in inches and acre-feet. The units used in this series of reports are second-feet, second-feet per square mile, and run-off in inches and acre-feet. They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second and is the rate of discharge of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed by the use of the factors given in the following table of equivalents.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

"Acre-foot" is equivalent to 43,560 cubic feet and is the quantity required to cover an acre to the depth of 1 foot. It is commonly used in connection with storage for irrigation work.

The following is a list of convenient equivalents for use in hydraulic computations:

1 second-foot equals 40 California miner's inches (law of Mar. 23, 1901).
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.
1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 gallons for one day.
1 second-foot equals 6.23 British imperial gallons per second.
1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day covers 1 square mile 0.03719 inch deep.
1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
1 second-foot for one day equals 1.983 acre-feet.
1 second-foot for one 28-day month equals 55.54 acre-feet.
1 second-foot for one 29-day month equals 57.52 acre-feet.
1 second-foot for one 30-day month equals 59.50 acre-feet.
1 second-foot for one 31-day month equals 61.49 acre-feet.
100 California miner's inches equals 18.7 United States gallons per second.
100 California miner's inches equals 96 Colorado miner's inches.
100 California miner's inches for one day equals 4.96 acre-feet.
100 Colorado miner's inches equals 2.60 second-feet.
100 Colorado miner's inches equals 19.5 United States gallons per second.
100 Colorado miner's inches equals 104 California miner's inches.
100 Colorado miner's inches for one day equals 5.17 acre-feet.
100 United States gallons per minute equals 0.223 second-foot.
100 United States gallons per minute for one day equals 0.442 acre-foot.
1,000,000 United States gallons per day equals 1.55 second-feet.
1,000,000 United States gallons equals 3.07 acre-feet.
1,000,000 cubic feet equals 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
$1\frac{1}{3}$ horsepower equals about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of theoretical power.

EXPLANATION OF DATA.

For each drainage basin there is given a brief general description, covering such items as area, source, tributaries, topography, geology, forestation, rainfall, irrigation, storage, power, and other interesting or important facts.

For each regular current-meter gaging station the following data, so far as available, are given: Description of station, list of discharge measurements, table of daily gage heights, table of daily discharges, table of monthly and yearly discharges, and run-off. For stations located at weirs or dams the gage-height table is omitted.

In addition to statements regarding the location and installation of current-meter stations the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such points as ice, logging, shifting channels, and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the accuracy and reliability of the data.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of hydrographer, width and area of cross section, gage height, and discharge in second-feet.

The table of daily gage heights records the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day. At most stations the gage is read in the morning and in the evening. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. All gage heights affected by the presence of ice in the streams or by backwater from obstructions are published as recorded, with suitable footnotes. The rating table is not applicable for such periods unless the proper corrections to the gage heights are known and applied. Attention is called to the fact that the zero of the gage is placed at an arbitrary datum and has no relation to zero flow or the bottom of the river. In general the zero is located somewhat below the lowest known flow, so that negative readings shall not occur.

The discharge measurements and gage heights are the base data from which rating tables, daily discharge tables, and monthly discharge tables are computed.

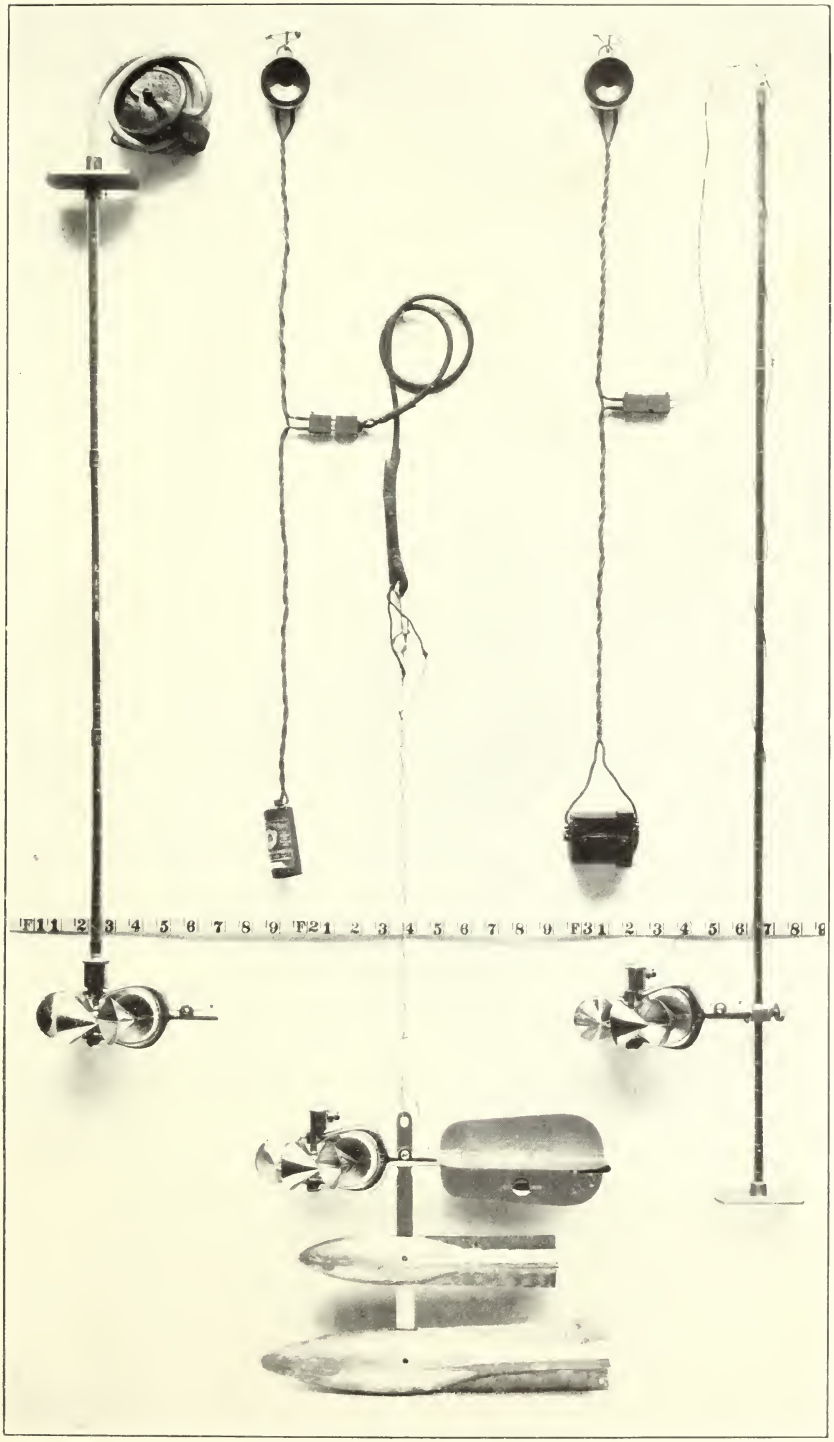
The rating table gives, either directly or by interpolation, the discharge in second-feet corresponding to every stage of the river recorded during the period for which it is applicable. It is not published in this report but can be determined from the daily gage heights and daily discharges for the purpose of verifying the published results as follows:

First plot the discharge measurements for the current and earlier years on cross-section paper with gage heights in feet as ordinates

A. FOR BRIDGE MEASUREMENT.

B. FOR WADING MEASUREMENT.

TYPICAL GAGING STATIONS.



SMALL PRICE CURRENT METERS

and discharge in second-feet as abscissas. Then tabulate a number of gage heights taken from the daily gage-height table for the complete range of stage given and the corresponding discharges for the days selected from the daily discharge table and plot the values on cross-section paper. The last points plotted will define the rating curve used and will lie among the plotted discharge measurements. After drawing the rating curve a table can be developed by scaling off the discharge in second-feet for each tenth foot of gage height. These values should be so adjusted that the first differences shall always be increasing or constant, except for known backwater conditions.

The table of daily discharges gives the discharges in second-feet corresponding to the observed gage heights as determined from the rating tables.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day it does not indicate correctly the stage when the water surface was at crest height, and the corresponding discharge was consequently larger than given in the maximum column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this the computations for the remaining columns, which are defined on page 10, are based.

The field methods used in the collection of the data presented in this series of reports are described in the introductory sections of Water-Supply Papers 261 to 272, inclusive, "Surface water supply of the United States, 1909." Plate I shows typical gaging stations. Plate II shows the various types of current meters [1] used in the work. A sample rating curve is shown on Plate III (p. 72).

ACCURACY AND RELIABILITY OF FIELD DATA AND COMPARATIVE RESULTS.

The accuracy of stream-flow data depends primarily on the natural conditions at the gaging station and on the methods and care with which the data are collected. Errors of the first group depend on the degree of permanency of channel and of permanency of the relation of discharge to stage.

Errors of the second class are due, first, to errors in observation of stage; second, to errors in measurement of flow; and third, to errors due to misinterpretation of stage and flow data.

Practically all discharge measurements made under fair conditions are well within 5 per cent of the true discharge at the time of observa-

[1] See Hoyt, J. C., and others, Use and care of the current meter as practiced by the United States Geological Survey: Trans. Am. Soc. Civil Eng., vol. 66, 1910, p. 70.

tion. Inasmuch as the errors of meter measurements are largely compensating, the mean rating curve when well defined is much more accurate than the individual measurements. Numerous experiments made to test the accuracy of current-meter work show that it compares very favorably with the results from standard weirs and, owing to simplicity of methods, usually gives results that are much more reliable than those from stations at dams, where the coefficient may be uncertain and conditions of flow are complicated.

The work is, of course, dependent on the reliability of the gage observers. With relatively few exceptions, the observers perform their work honestly. The records are, however, closely watched, and the cause of any discrepancy is investigated. It is obvious that one gage reading a day does not always give the mean height for that day. As an almost invariable rule, however, errors from this source are compensating and virtually negligible in a period of one month, although a single day's reading may, when taken by itself, be considerably in error.

An effort is made to visit every station at least once each year for the purpose of making a measurement to determine the constancy of conditions of flow since the last measurement made in the preceding year, and also to check the elevation of the gage. On account of lack of funds or for other causes some stations were not visited during the current year. If conditions of flow have been reasonably permanent up to the time of the last preceding measurement, it is considered best to publish estimates of discharge based on the latest verified rating curve rather than to omit them altogether, although it should be distinctly understood that such records are at times subject to considerable error. This is also true, although to a less degree, of the period of records since the date of the last measurement of the current year. As a rule, the accuracy notes are based on the assumption that the rating curve used is strictly applicable to the current year.

In order to give engineers and others information regarding the probable accuracy of the computed results, footnotes are added to the daily discharge tables, stating the probable accuracy of the rating tables used, and an accuracy column is inserted in the monthly discharge table. For the rating tables "well defined" indicates, in general, that the rating is probably accurate within 5 per cent; "fairly well defined," within 10 per cent; "poorly defined" or "approximate," within 15 to 25 per cent. These notes are very general and are based on the platting of the individual measurements with reference to the mean rating curve.

The accuracy column in the monthly discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean. It is based on the accuracy of the rating, the prob-

able reliability of the observer, and knowledge of local conditions. In this column A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

USE OF THE DATA.

In general the base data which are collected in the field by the Survey engineers are published, not only to comply with the law but also for the express purpose of giving to any engineer the opportunity of examining the computed results and of changing and adjusting them as may seem best to him. Although it is believed that the rating tables and computed monthly discharges are as good as the base data up to and including the current year will warrant, it should always be borne in mind that the additional data collected at each station from year to year nearly always throw new light on data already collected and published, and hence allow more or less improvement in the computed results of earlier years. It is therefore expected that the engineer who makes serious use of the figures presented in these papers will verify all ratings and make such adjustments for earlier years as may seem necessary. The work of compiling, studying, revising, and republishing data for different drainage basins for 5 or 10 year periods or more is carried on by the United States Geological Survey so far as the funds for such work are available.

The estimates in the table of monthly discharge are so arranged as to give only a general idea of the conditions of flow at the station, and it is not expected that they will be used for other than preliminary estimates.

The daily discharges are published to allow a more detailed study of the variation in flow and to determine the periods of deficient flow.

COOPERATIVE DATA.

Cooperative data of various kinds and data regarding the run-off at many stations maintained wholly by private funds are incorporated in the surface water supply reports of the United States Geological Survey.

Many stations throughout the country are maintained for specific purposes by private parties who supply the records gratuitously to the United States Geological Survey for publication. When such records are furnished by responsible parties and appear to be reasonably accurate, they are verified, so far as possible, and estimated values of accuracy are given. Records clearly worthless or misleading are not published. As it is, however, impossible to completely verify all such records furnished—because of lack of funds or for other causes—they are published for what they are worth, as they

are of value as a matter of record and afford at least approximate information regarding stream flow at the particular localities. The Survey does not, however, assume any responsibility for inaccuracies found in such records, although most of them are believed to be reasonably good.

COOPERATION AND ACKNOWLEDGMENTS.

Special acknowledgments are due for assistance rendered or records furnished by the United States Engineer Corps, United States Weather Bureau, North Georgia Electric Co., Central Georgia Power Co., Geological Survey of Alabama, Wilson Aluminum Co., Roanoke Railway & Electric Co., Rockingham Power Co., and Tennessee Coal, Iron & Railroad Co.

DIVISION OF WORK.

The field data in the James and Roanoke drainage basins were collected under the direction of R. H. Bolster, assistant engineer, assisted by G. C. Stevens.

The field data for all drainage basins south of Roanoke River were collected by M. R. Hall, district engineer, assisted by E. H. Swett and F. P. Thomas.

The ratings, special estimates, and studies of the completed data were made by M. R. Hall and J. G. Mathers. The computations were made and the completed data prepared for publication by G. C. Stevens, J. G. Mathers, H. J. Dean, and A. H. Tuttle.

The entire report was edited by Mrs. B. D. Wood.

GAGING STATIONS MAINTAINED IN SOUTH ATLANTIC COAST AND EASTERN GULF OF MEXICO DRAINAGE BASINS.

The following list comprises the gaging stations regularly maintained in south Atlantic coast and eastern Gulf of Mexico drainage basins by the United States Geological Survey and cooperative parties. Data for these stations have appeared in the published reports as shown in tables on pages 7–9. The stations are arranged by river basins and appear in downstream order, tributaries of main streams being indicated by indention. (See p. 10.)

South Atlantic coast drainage basins:
- James River basin:
  - Jackson River at Covington, Va., 1907–8.
  - James River at Buchanan, Va., 1895–1910.
  - James River at Holcomb Rock, Va., 1900–1910.
  - James River at Cartersville, Va., 1899–1910.
    - Cowpasture River near Clifton Forge, Va., 1907–8.
    - North Fork of James River near Glasgow, Va., 1895–1905.
    - Appomattox River at Mattoax, Va., 1900–1905.

South Atlantic coast drainage basins—Continued.
- Roanoke River basin:
  - Roanoke River at Roanoke, Va., 1896–1910.
  - Roanoke River at Randolph, Va., 1900–1906.
  - Roanoke River above the Dan at Clarksville, Va., 1895–1898.
  - Roanoke River at Neal, N. C., 1896–1903.
    - Tinker Creek at Roanoke, Va., 1907–8.
    - Back Creek near Roanoke, Va., 1907–8.
    - Dan River at Madison, N. C., 1903–1908.
    - Dan River at South Boston, Va., 1900–1907.
    - Dan River at Clarksville, Va., 1895–1898.
      - Banister River at Houston, Va., 1904–5.
- Tar River basin:
  - Tar River near Tarboro, N. C., 1896–1900.
- Neuse River basin:
  - Neuse River near Selma, N. C., 1896–1900.
- Cape Fear River basin:
  - Haw River near Moncure, N. C., 1898–99.
  - Cape Fear River near Fayetteville, N. C., 1889–1903.
    - Deep Creek near Cumnock, N. C., 1900–1902.
    - Deep Creek near Moncure, N. C., 1898–99.
    - Rockfish Creek near Brunt, N. C., 1902–3.
- Yadkin River basin:
  - Yadkin River at North Wilkesboro, N. C., 1903–1909.
  - Yadkin River near Siloam, N. C., 1900–1901.
  - Yadkin River near Salisbury, N. C., 1895–1909.
  - Yadkin River near Norwood, N. C., 1896–1899.
  - Yadkin River near Pedee, N. C., 1906–1910.
  - Pedee River at Cheraw, S. C., 1909–10.
- Santee River basin:
  - Catawba River at Old Fort, N. C., 1907.
  - Catawba River near Morganton, N. C., 1900–1909.
  - Catawba River near Catawba, N. C., 1896–1905.
  - Catawba River near Rockhill, S. C., 1895–1903.
  - Wateree River near Camden, S. C., 1904–1910.
    - Mill Creek at Old Fort, N. C., 1907.
    - Linville River at Fonta Flora, N. C., 1907–8.
    - Linville River near Bridgewater, N. C., 1900.
    - Johns River at Collettsville, N. C., 1907.
    - Johns River near Morganton, N. C., 1900–1901.
  - Congaree River basin:
    - Broad River (of the Carolinas) at Uree, N. C., 1907–1909.
    - Broad River (of the Carolinas) at Dellinger, S. C., 1900–1901.
    - Broad River (of the Carolinas) near Gaffney, S. C., 1896–1899.
    - Broad River (of the Carolinas) at Alston, S. C., 1896–1907.
      - Green River near Saluda, N. C., 1907–1909.
      - Second Broad River near Logan's store, N. C., 1907–8.
      - Saluda River near Waterloo, S. C., 1896–1905.
      - Saluda River near Ninety Six, S. C., 1905.
- Savannah River basin:
  - Chattooga River near Clayton, Ga., 1907–8.
  - Tugaloo River near Toccoa, Ga., 1907–8.
  - Tugaloo River near Madison, S. C., 1898–1910.

South Atlantic coast drainage basins—Continued.
- Savannah River basin—Continued.
  - Savannah River near Calhoun Falls, S. C., 1896–1903.
  - Savannah River at Woodlawn, S. C., 1905–1910.
  - Savannah River at Augusta, Ga., 1899–1906.
    - Stekoa Creek near Clayton, Ga., 1907–8.
    - Tallulah River at Tallulah Falls, Ga., 1900–1910.
    - Chauga River near Madison, S. C., 1907.
    - Seneca River near Clemson College, S. C., 1903–1905.
    - Broad River (of Georgia) near Carlton, Ga., 1897–1910.
- Ogeechee River basin:
  - Ogeechee River near Millen, Ga., 1903.
    - Williamson's Swamp Creek near Davisboro, Ga., 1903–4.
    - Cannoochee River near Groveland, Ga., 1903–1907.
- Altamaha River basin:
  - South River near Lithonia, Ga., 1903–4.
    - Ocmulgee River near Jackson, Ga., 1906–1910.
    - Ocmulgee River near Flovilla, Ga., 1901–1905.
  - Ocmulgee River at Macon, Ga., 1893–1910.
    - Yellow River at Almon, Ga., 1897–1901.
    - Alcovy River near Covington, Ga., 1901–1904.
    - Alcovy River near Stewart, Ga., 1905–6.
    - Towaliga River near Juliette, Ga., 1899–1901.
    - Oconee River at Barnett Shoals, near Watkinsville, Ga., 1901–2.
    - Oconee River near Greensboro, Ga., 1903–1910.
    - Oconee River at Carey, Ga., 1896–1898.
    - Oconee River at Fraleys Ferry, near Milledgeville, Ga., 1905–1910.
    - Oconee River at Milledgeville, Ga., 1893–1905.
    - Oconee River at Dublin, Ga., 1897–1910.
      - Middle Oconee River near Athens, Ga., 1901–2.
      - Apalachee River near Buckhead, Ga., 1901–1908.
    - Ohoopee River near Reidsville, Ga., 1903–1907.
- St. John River basin:
  - Silver Springs River near Silver Springs, Fla., 1906.

Eastern Gulf of Mexico drainage basins:
- Suwanee River basin:
  - Suwanee River near White Springs, Fla., 1906–1908.
- Apalachicola River basin:
  - Chattahoochee River near Aerial, Ga., 1907–1909.
  - Chattahoochee River near Leaf, Ga., 1907.
  - Chattahoochee River near Gainesville, Ga., 1901–1903.
  - Chattahoochee River near Buford, Ga., 1901.
  - Chattahoochee River near Norcross, Ga., 1902–1910.
  - Chattahoochee River near Oakdale, Ga., 1895–1904.
  - Chattahoochee River at West Point, Ga., 1896–1910.
  - Chattahoochee River at Alaga, Ala., 1908–1910.
    - Soque River near Demorest, Ga., 1904–1909.
    - Sweetwater Creek near Austell, Ga., 1904–5.
    - Flint River near Woodbury, Ga., 1900–1910.
    - Flint River near Mussela, Ga., 1907.
    - Flint River near Montezuma, Ga., 1905–1910.
    - Flint River at Albany, Ga., 1902–1910.

Eastern Gulf of Mexico drainage basins—Continued.
- Apalachicola River basin—Continued.
  - Chattahoochee River—Continued.
    - Flint River at Bainbridge, Ga., 1908–1910.
      - Kinchafoonee Creek near Leesburg, Ga., 1905–1909.
      - Kinchafoonee Creek near Albany, Ga., 1903.
        - Muckalee Creek near Albany, Ga., 1903.
      - Ichawaynochaway Creek at Milford, Ga., 1905–1907.
- Choctawhatchee River basin:
  - Choctawhatchee River near Newton, Ala., 1906–1908.
  - Choctawhatchee River near Geneva, Ala., 1904.
    - Double Bridge Creek at Geneva, Ala., 1904.
    - Pea River at Pera, Ala., 1904–1910.
    - Pea River at Elba, Ala., 1906.
- Escambia River basin:
  - Conecuh River at Beck, Ala., 1904–1910.
- Mobile River basin:
  - Cartecay River near Cartecay, Ga., 1904–5, 1907.
  - Coosawattee River at Carters, Ga., 1896–1908.
  - Oostanaula River at Resaca, Ga., 1896–1910.
  - Coosa River at Rome, Ga., 1897–1903.
  - Coosa River at Lock No. 4, above Riverside, Ala., 1890–1901.
  - Coosa River at Riverside, Ala., 1896–1910.
  - Coosa River at Lock No. 5, near Childersburg, Ala., 1892–1897.
  - Coosa River near Wetumpka, Ala., 1896–1898.
  - Alabama River at Montgomery, Ala., 1899–1903.
  - Alabama River at Selma, Ala., 1900–1910.
    - Ellijay River at Ellijay, Ga., 1907.
    - Conasauga River at Beaverdale, Ga., 1907–8.
    - Etowah River near Ball Ground, Ga., 1907–1910.
    - Etowah River at Canton, Ga., 1892–1905.
    - Etowah River near Rome, Ga., 1904–1910.
    - Etowah River at Rome, Ga., 1903.
      - Amicalola River near Potts Mountain, Ga., 1907–8 and 1910.
    - Choccolocco Creek at Jenifer, Ala., 1903–1908.
    - Talladega Creek at Nottingham, Ala., 1900–1904.
    - Tallapoosa River at Sturdevant, Ala., 1900–1910.
    - Tallapoosa River near Susanna, Ala., 1900–1901.
    - Tallapoosa River at Milstead, Ala., 1897–1903.
      - Hillabee Creek near Alexander City, Ala., 1900–1903.
      - Big Sandy Creek near Dadeville, Ala., 1900–1901.
    - Cahaba River at Centerville, Ala., 1901–1908.
    - Tombigbee River at Columbus, Miss., 1900–1910.
    - Tombigbee River at Epes, Ala., 1900–1910.
      - Black Warrior River near Cordova, Ala., 1900–1910.
      - Black Warrior River near Coal, Ala., 1908–1910.
      - Black Warrior River at Tuscaloosa, Ala., 1889–1905.
        - Clear Creek near Elk, Ala., 1904–5.
        - Locust Fork of Black Warrior River at Palos, Ala., 1901–1905.
          - Village Creek near Mulga, Ala., 1909.
            - Camp Branch near Ensley, Ala., 1908–1910.
            - Venison Branch near Mulga, Ala., 1908–9.
- Pearl River basin:
  - Pearl River at Jackson, Miss., 1901–1910.
    - Bogue Chitto at Warnerton, La., 1906.

SOUTH ATLANTIC STATES DRAINAGE BASINS.

JAMES RIVER BASIN.

DESCRIPTION.

The basin of James River, the most important stream in Virginia, extends entirely across the southern part of the State from east to west. It is bounded on the north by the Potomac and York River basins and on the south by the basin of the Roanoke. Its entire area comprises approximately 9,700 square miles.

James River proper is formed by the junction of Jackson and Cowpasture rivers in the northern part of Botetourt County. Jackson River drains a long, narrow basin bounded on the west by the main range of the Allegheny Mountains and on the east by a secondary range of the same system. Still other ranges divide its basin into parallel steep-sided valleys.

The basin of Cowpasture River, like that of the Jackson, is long and narrow. It lies parallel to and east of the Jackson Basin and extends as far east as the Blue Ridge.

From the junction of Jackson and Cowpasture rivers the James flows in a general easterly course leading into the lower part of Chesapeake Bay. Its length is about 335 miles. The important tributaries in descending order are Craig Creek and North, Pedlar, Buffalo, Rockfish, Hardware, Slate, Rivanna, Willis, Appomattox, and Chickahominy rivers.

Near Clifton Forge and again near Balcony Falls the James flows through ridges of the Alleghenies and makes sharp falls over beds of solid rock. At other points, as the river cuts through the lesser foothills, are similar though less pronounced falls and rapids. The fall line is crossed at Richmond.

The James traverses three distinct topographic provinces—the Allegheny Mountain region, extending from the western edge of the basin to the Blue Ridge; the Piedmont Plateau, extending from the Blue Ridge to the fall line; and the Coastal Plain, extending eastward from Richmond. In the Allegheny region the surface is much broken and slopes are steep; this section contains important deposits of limestone, marble, lead ores, and anthracite and bituminous coal. In the Piedmont Plateau region the topography is rolling, the uplands are rounded, and range in altitude is small; this section contains the bituminous coal fields of Goochland, Chesterfield, Powhatan, and Prince Edward counties. The characteristic strata of the Coastal Plain are horizontal beds of clay and sand abounding in fossil shells; the region is generally low and in some parts swampy. Altitude for the entire basin ranges from sea level to 4,000 feet on the crest of the mountains.

Except on the mountain sides in the upper part of the basin, which are forested, the drainage area is largely cleared and under cultivation.

The mean annual rainfall, as shown by the records of the United States Weather Bureau, ranges from 40 to 50 inches, being heaviest at the mouth of the river and decreasing to 45 inches at Richmond. Between this latter point and the upper part of the basin the range is between 40 and 45 inches.

The river lies so far south that its flow is affected by ice for only short periods, ranging from a few days to two or three weeks.

A study of the Survey's topographic sheets, which cover nearly the entire basin, shows that the upper valleys are so narrow and the headwaters have so much fall that few sites could be utilized for reservoirs of any considerable capacity without building dams of great height and length.

A reconnaissance made in 1897 showed 18 dams across James River between Clifton Forge and Richmond. Many of these dams were built to divert water into the old James & Kanawha Canal, which followed the river from Richmond to Buchanan and at one time was utilized through that entire distance. This canal has now been abandoned, and its right of way is owned by the Chesapeake & Ohio Railway. The use of the dams was abandoned with the canal, and although many of them are in good repair they have not been improved for power development.

The following publications contain information in regard to the surface waters of the James River basin:

Nineteenth Annual Report United States Geological Survey, part 4, pages 162–173; full report of the 1897 reconnaissance, including brief descriptions of the various dams and the profile of James River.

Hydrography of Virginia, Bulletin Geological Survey of Virginia No. 3, 1906, pages 94–162; full report of 1897 reconnaissance, description of dams, and profile of river; and all records and discharge data collected in the James River basin prior to 1906, revised by engineers of the United States Geological Survey, published by the Virginia Board of Agriculture and Immigration, Richmond, Va.

United States Forest Service Circulars Nos. 143 and 144, Relation of southern Appalachian Mountains to the development of inland water navigation and water power.

JAMES RIVER AT BUCHANAN, VA.

This station, which is located at the highway bridge near the Chesapeake & Ohio Railway depot at Buchanan, was established August 18, 1895. Previous to July 15, 1906, the observations of daily gage height were made by employees of the Geological Survey, but since that time the records have been obtained from the Weather Bureau.

Purgatory Creek, the nearest tributary, enters one-half mile below the bridge. The nearest important tributary is North Branch of James River, which enters 20 miles below Buchanan.

The ice at this station is of slight extent and usually lasts only for short periods.

The datum of the original wire gage, attached to the highway bridge, was lowered 2 feet April 3, 1897, to avoid negative readings; subsequently the datum of the gage has remained constant. The wire gage was replaced by a chain gage November 21, 1903.

The bed of the river under the bridge is composed of rock overlain with a heavy deposit of mud. There is a rock control several hundred feet below the station, but the plotting of the discharge measurements indicates changing conditions of flow at the bridge. The ratings developed are fairly accurate, however, for the periods which they cover.

The following discharge measurement was made by G. C. Stevens:

September 6: Width, 310 feet; area of section, 1,030 square feet; gage height, 2.46 feet; discharge, 859 second-feet.

Daily gage height, in feet, of James River at Buchanan, Va., for 1910.

[D. D. Booze, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.1	3.0	4.9	2.6	3.6	2.6	3.2	2.5	2.0	2.0	2.0	1.9
2	2.3	2.9	7.1	2.6	3.5	2.6	3.0	2.5	2.0	2.0	2.0	1.9
3	2.4	2.9	6.0	2.6	3.3	2.5	2.9	2.5	2.0	1.9	2.0	2.0
4	2.4	3.2	5.3	2.7	3.2	2.5	2.9	2.4	2.7	1.9	2.0	2.0
5	3.1	3.8	4.9	3.1	3 1	2.5	2.9	2.4	3.0	1.9	2.0	2.0
6	3.3	3.6	4.5	3.2	3.3	2.6	3.2	2.3	2.5	1.9	2.0	2.0
7	4.9	3.3	4.3	3.0	2.9	2.9	3.2	2.3	2.3	1.9	1.9	2.0
8	6.2	3.0	4.1	2.9	3.0	3.1	3.1	2.3	2.3	2.0	1.9	2.0
9	4.6	3.2	4.0	2.8	3.1	2.9	3.0	2.3	2.2	2.2	1.9	2.0
10	3.9	3.1	3.8	2.7	3.0	2.8	4.0	2.2	2.2	2.3	1.9	2.0
11	3.7	3.0	3.7	2.7	3.0	4.3	3.4	2.2	2.1	2.2	1.9	2.0
12	3.5	3.0	3.6	2.7	2.9	6.7	3.2	2.2	2.1	2.1	1.9	2.0
13	3.3	2.9	3.4	2.9	2.9	10.8	3.1	2.1	2.1	2.1	1.9	2.0
14	3.3	2.8	3.4	4.3	2.8	15.6	3.0	2.1	2.0	2.0	1.9	1.9
15	3.2	3.0	3.4	3.8	2.8	9.8	3.0	2.1	2.0	2.0	1.9	1.9
16	3.1	3.2	3.3	3.6	2.8	10.5	3.1	2.1	2.0	2.0	1.9	1.9
17	2.9	4.3	3.2	3.8	2.8	14.4	5.0	2.1	2.0	1.9	1.9	1.9
18	2.7	7.8	3.1	4.8	2.8	9.3	5.6	2.1	2.0	1.9	1.9	1.9
19	2.7	7.9	3.1	5.3	2.8	6.8	8.4	2.1	2.0	1.9	1.9	2.0
20	3.9	5.6	3.0	4.9	2.7	6.0	5.8	2.1	1.9	2.0	1.9	2.0
21	3.7	5.3	3.0	4.5	2.7	5.3	4.6	2.1	1.9	2.1	1.9	2.0
22	8.7	4.9	3.0	4.2	2.7	5.1	4.0	2.1	1.9	2.1	1.9	2.0
23	6.4	4.6	2.9	3.9	2.7	4.9	3.7	2.1	1.9	2.3	1.9	2.0
24	5.3	4.4	2.9	3.7	2.7	4.3	3.5	2.1	1.9	2.4	1.9	2.0
25	4.3	4.2	2.8	3.6	2.7	4.2	3.3	2.1	1.9	2.3	1.9	2.2
26	3.8	4.1	2.8	3.6	3.1	4.0	3.1	2.1	1.9	2.2	1.9	2.5
27	3.7	3.9	2.7	3.6	3.0	3.7	3.0	2.1	1.9	2.1	1.9	2.5
28	3.5	3.8	2.7	3.8	2.9	3.5	2.8	2.1	1.9	2.1	1.9	2.7
29	3.3	.....	2.7	3.9	2.8	3.5	2.7	2.1	1.9	2.1	1.9	2.9
30	3.1	.....	2.7	3.8	2.7	3.4	2.6	2.0	2.0	2.0	1.9	3.4
31	3.0	.....	2.6	.....	2.6	.....	2.5	2.0	.....	2.0	.....	3.7

Daily discharge, in second-feet, of James River at Buchanan, Va., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	585	1,480	4,880	1,030	2,340	1,030	1,740	930	515	515	515	450
2	745	1,360	10,400	1,030	2,180	1,030	1,480	930	515	515	515	450
3	835	1,360	7,460	1,030	1,880	930	1,360	930	515	450	515	515
4	835	1,740	5,780	1,140	1,740	930	1,360	835	1,140	450	515	515
5	1,610	2,680	4,880	1,610	1,610	930	1,360	835	1,480	450	515	515
6	1,880	2,340	4,030	1,740	1,880	1,030	1,740	745	930	450	515	515
7	4,880	1,880	3,620	1,480	1,360	1,360	1,740	745	745	450	450	515
8	7,970	1,480	3,240	1,360	1,480	1,610	1,610	745	745	515	450	515
9	4,240	1,740	3,040	1,240	1,610	1,360	1,480	745	660	660	450	515
10	2,860	1,610	2,680	1,140	1,480	1,240	3,040	660	660	745	450	515
11	2,500	1,480	2,500	1,140	1,480	3,620	2,030	660	585	660	450	515
12	2,180	1,480	2,340	1,140	1,360	9,300	1,740	660	585	585	450	515
13	1,880	1,360	2,030	1,360	1,360	23,600	1,610	585	585	585	450	515
14	1,880	1,240	2,030	3,620	1,240	47,000	1,480	585	515	515	450	450
15	1,740	1,480	2,030	2,680	1,240	19,500	1,480	585	515	515	450	450
16	1,610	1,740	1,880	2,340	1,240	22,300	1,610	585	515	515	450	450
17	1,360	3,620	1,740	2,680	1,240	40,700	5,100	585	515	450	450	450
18	1,140	12,500	1,610	4,660	1,240	17,600	6,480	585	515	450	450	450
19	1,140	12,800	1,610	5,780	1,240	9,580	14,400	585	515	450	450	515
20	2,860	6,480	1,480	4,880	1,140	7,460	6,960	585	450	515	450	515
21	2,500	5,780	1,480	4,030	1,140	5,780	4,240	585	450	585	450	515
22	15,400	4,880	1,480	3,430	1,140	5,330	3,040	585	450	585	450	515
23	8,500	4,240	1,360	2,860	1,140	4,880	2,500	585	450	745	450	515
24	5,780	3,820	1,360	2,500	1,140	3,620	2,180	585	450	835	450	515
25	3,620	3,430	1,240	2,340	1,140	3,430	1,880	585	450	745	450	660
26	2,680	3,240	1,240	2,340	1,610	3,040	1,610	585	450	660	450	930
27	2,500	2,860	1,140	2,340	1,480	2,500	1,480	585	450	585	450	930
28	2,180	2,680	1,140	2,680	1,360	2,180	1,240	585	450	585	450	1,140
29	1,880	.....	1,140	2,860	1,240	2,180	1,140	585	450	585	450	1,360
30	1,610	.....	1,140	2,680	1,140	2,030	1,030	515	515	515	450	2,030
31	1,480	.....	1,030	.....	1,030	.....	930	515	.....	515	.....	2,500

NOTE.—These discharges were obtained from a rating curve which is well defined below 20,300 second-feet.

Monthly discharge of James River at Buchanan, Va., for 1910.

[Drainage area, 2,060 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	15,400	585	3,000	1.46	1.68	A
February	12,800	1,240	3,310	1.61	1.68	A
March	10,400	1,030	2,680	1.30	1.50	A
April	5,780	1,030	2,370	1.15	1.28	A
May	2,340	1,030	1,420	.689	.79	A
June	47,000	930	8,240	4.00	4.46	B
July	14,400	930	2,620	1.27	1.46	A
August	930	515	658	.319	.37	A
September	1,480	450	592	.287	.32	A
October	835	450	561	.272	.31	A
November	515	450	463	.225	.25	A
December	2,500	450	692	.336	.39	A
The year	47,000	450	2,200	1.07	14.49	

JAMES RIVER AT HOLCOMB ROCK, VA.

This station, which is located at the works of the Wilson Aluminum Co., at Holcomb Rock, was established in 1899. Since January, 1900, two readings daily have been furnished to the United States Geological Survey through the courtesy of George O. Seward, general manager of the company.

The gage consists of a copper float inclosed in a stilling box, and a vertical rod extending up through the power-house floor. No rating curve has been developed for this station.

Daily gage height, in feet, of James River at Holcomb Rock, Va., for 1910.

[J. H. Webb, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.05	2.05	4.8	1.7	2.65	1.55	2.15	1.45	1.3	1.15	1.15	1.05
2	1.2	1.9	7.2	1.6	2.5	1.5	2.1	1.4	1.4	.8	.9	1.1
3	1.4	1.95	5.85	1.45	2.3	1.5	2.0	1.35	1.35	1.05	.9	.95
4	1.45	2.25	4.9	1.75	2.15	1.5	1.9	1.5	1.25	.85	1.0	.65
5	1.75	2.5	4.2	1.8	2.05	1.15	2.15	1.4	1.4	.95	1.1	1.1
6	1.95	2.5	3.55	2.0	1.85	1.55	2.0	1.3	1.7	.9	.8	1.3
7	2.85	2.35	3.35	1.9	1.8	1.6	2.55	1.15	1.35	1.0	1.0	1.0
8	5.45	2.1	3.05	1.8	1.65	1.75	2.4	1.4	1.3	1.3	1.0	1.2
9	3.7	2.2	2.85	1.8	2.05	1.7	2.4	1.3	1.4	1.45	.95	1.15
10	2.9	2.1	2.65	1.5	1.85	1.6	2.4	1.35	1.4	1.5	.95	1.05
11	2.3	2.0	2.6	1.6	1.8	2.95	2.45	1.3	.8	1.5	1.0	.8
12	2.25	2.0	2.5	1.6	1.8	7.35	2.2	1.25	1.1	1.5	1.0	1.25
13	2.15	1.6	2.35	1.85	1.8	10.35	2.1	1.3	1.05	.85	.25	1.1
14	2.0	1.85	2.25	2.35	1.8	15.6	2.25	.7	1.0	1.05	1.0	.95
15	1.9	1.9	2.2	2.4	1.65	10.2	2.9	1.35	1.1	.95	.95	1.0
16	1.75	1.95	2.2	2.3	1.7	12.65	2.9	1.3	1.2	.8	1.0	.9
17	1.8	2.7	2.1	3.65	1.7	14.5	3.75	.9	1.2	.95	1.0	.9
18	1.7	9.0	2.1	5.75	1.7	9.8	4.35	1.05	.7	.75	.9	.6
19	1.85	8.95	2.1	5.45	1.7	6.8	7.7	1.35	1.0	1.1	.8	.8
20	2.1	5.3	2.0	4.45	1.7	5.85	4.9	1.2	1.1	1.05	.65	.75
21	4.05	4.35	2.0	3.8	1.7	4.65	3.55	.85	.85	1.15	1.0	1.05
22	8.65	4.2	1.9	3.25	1.4	4.1	2.95	1.3	.95	1.35	.9	.8
23	6.45	4.45	1.9	2.85	2.95	3.75	2.65	1.3	.85	1.05	.95	1.0
24	4.35	4.25	1.7	2.65	1.7	3.7	2.0	1.5	.85	1.45	.95	1.15
25	3.4	3.55	1.75	2.55	1.85	3.9	2.15	1.15	.8	1.4	.85	1.05
26	2.95	3.2	1.75	2.7	1.9	2.85	1.95	.55	1.05	1.35	1.05	1.25
27	2.65	2.8	1.55	2.8	1.95	2.75	1.9	1.15	.95	1.1	.5	1.8
28	2.55	2.95	1.75	2.9	1.8	2.7	1.8	1.0	1.15	1.1	1.15	1.15
29	2.45	.....	1.7	2.9	1.6	2.4	1.8	1.35	.95	1.15	1.2	1.35
30	2.3	.....	1.7	2.9	1.7	2.4	1.7	1.3	.95	.85	1.15	1.6
31	2.3	.....	1.65	.....	1.55	.....	1.35	1.3	.....	.85	.....	2.75

JAMES RIVER AT CARTERSVILLE, VA.

This station, which is located at the highway bridge crossing the James between Pemberton and Cartersville, about 50 miles above Richmond, was established January 1, 1899.

Willis River enters James River from the south about 1 mile above the station, and Rivanna River comes in from the north about 7 miles above. No important tributaries enter between Cartersville and Richmond.

During severe winters the discharge at this station is affected for short periods by ice.

The datum of the chain gage, which is attached to the bridge, has remained the same since the establishment of the station.

Discharge measurements are made from the bridge. Three or four measurements must be made each year to adequately define the discharge curve, as the river shows great range in stage and in quantity of débris and sediment carried. The left bank overflows for several hundred feet at a stage of about 20 feet. Above the overflow point the discharge is uncertain. The right bank does not overflow.

The following discharge measurement was made by G. C. Stevens:

September 7: Width, 652 feet; area of section, 1,710 square feet; gage height, 1.62 feet; discharge, 2,690 second-feet.

Daily gage height, in feet, of James River at Cartersville, Va., for 1910.

[B. W. Palmore, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.45	3.40	7.79	2.17	4.00	2.13	3.03	1.55	1.15	0.79	1.18	1.27
2	1.65	3.06	8.65	2.06	3.67	2.00	2.77	1.53	1.40	.84	1.18	1.16
3	2.01	3.13	9.37	2.23	3.43	1.89	2.61	1.79	1.35	.86	1.32	1.11
4	1.97	3.73	7.63	2.43	3.20	1.83	2.55	1.44	1.43	.78	1.68	1.08
5	2.04	4.26	6.61	2.51	2.93	1.76	3.60	1.39	1.80	.71	1.58	1.08
6	1.91	3.97	6.09	2.41	2.84	1.99	3.07	1.32	1.57	.69	1.40	1.28
7	3.23	3.45	5.15	2.27	2.73	2.07	2.73	1.24	1.60	.72	1.26	1.42
8	3.76	3.17	4.67	2.26	2.79	2.03	3.60	1.17	1.58	1.38	1.28	1.58
9	5.10	3.23	4.37	2.26	2.74	2.07	4.57	1.09	1.46	2.82	1.20	1.51
10	4.57	3.30	4.07	2.17	2.73	2.63	3.70	1.19	1.16	4.06	1.21	1.42
11	3.73	2.94	3.83	2.06	2.77	3.71	2.73	1.23	1.09	2.28	1.18	1.40
12	3.47	2.91	3.61	2.01	2.59	5.93	4.05	1.06	1.02	1.86	1.12	1.42
13	2.97	2.90	3.37	2.31	2.57	10.45	3.35	1.03	1.04	1.56	1.00	1.18
14	2.73	2.79	3.23	2.46	2.53	12.95	4.50	1.06	1.07	1.34	.92	1.12
15	2.63	2.78	3.15	2.63	2.43	17.01	3.87	1.19	1.02	1.27	1.11	1.26
16	2.45	3.20	3.10	3.23	2.33	18.65	3.36	1.29	1.06	1.08	1.02	1.24
17	2.27	3.51	2.94	7.03	2.24	19.89	3.75	1.29	1.01	.99	1.11	1.28
18	2.43	7.50	2.87	10.30	2.31	16.85	4.83	1.21	1.00	.96	1.10	1.34
19	2.46	10.91	2.74	9.35	2.21	11.47	8.10	1.15	.89	.98	1.08	1.38
20	2.43	10.33	2.67	8.35	2.16	8.63	8.66	1.26	.98	1.76	1.00	1.37
21	3.15	7.28	2.60	6.70	2.14	6.87	8.60	1.19	.94	2.25	1.02	1.30
22	10.99	6.67	2.57	5.55	2.23	5.67	4.45	1.43	.89	1.88	1.02	1.25
23	9.80	6.25	2.56	5.00	2.67	4.45	3.85	1.62	.97	2.75	1.00	1.05
24	7.77	5.73	2.47	4.85	2.63	3.73	3.79	1.27	.91	2.12	1.08	1.88
25	6.77	5.47	2.35	5.13	3.01	3.63	3.57	1.17	.88	1.76	1.09	1.98
26	5.03	4.90	2.26	4.67	3.58	3.53	2.47	1.16	.80	1.81	1.08	2.18
27	4.29	4.57	2.25	4.27	3.43	3.45	2.33	1.21	.81	1.58	.96	2.08
28	3.87	4.11	2.23	4.09	2.75	3.44	2.09	1.12	.82	1.45	1.09	2.31
29	3.73	.....	2.17	4.15	2.63	3.39	1.87	1.02	.78	1.32	1.08	2.34
30	3.67	.....	2.25	4.09	2.35	3.21	1.71	.90	.68	1.39	1.18	2.40
31	3.61	.....	2.16	.....	2.16	.....	1.63	1.06	.....	1.32	.....	2.52

NOTE.—Floating ice in the river Dec. 7-16 and 18-21.

Daily discharge, in second-feet, of James River at Cartersville, Va., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,040	5,920	18,300	3,340	7,360	3,270	5,600	2,450	1,820	1,240	1,880	2,040
2	2,380	5,150	21,100	3,130	6,560	3,020	5,030	2,510	2,270	1,310	1,880	1,840
3	3,040	5,310	23,600	3,460	5,990	2,810	4,690	3,010	2,180	1,250	2,130	1,760
4	2,960	6,700	17,800	3,850	5,460	2,700	4,560	2,340	2,320	1,220	2,790	1,710
5	3,100	8,030	14,600	4,010	4,870	2,580	6,880	2,250	3,030	1,120	2,600	1,710
6	2,850	7,280	13,100	3,810	4,680	3,000	5,680	2,130	2,580	1,080	2,270	2,050
7	5,530	6,040	10,400	3,530	4,450	3,150	4,940	1,980	2,640	1,130	2,020	2,310
8	6,770	5,390	9,110	3,510	4,580	3,080	6,880	1,860	2,600	2,230	2,050	2,600
9	10,300	5,530	8,310	3,510	4,470	3,150	9,200	1,720	2,380	5,130	1,910	2,470
10	8,840	5,690	7,540	3,340	4,450	4,250	7,110	1,890	1,840	7,960	1,930	2,310
11	6,700	4,890	6,940	3,130	4,540	6,650	4,940	1,960	1,720	4,000	1,880	2,270
12	6,080	4,830	6,410	3,040	4,170	12,600	7,940	1,670	1,600	3,150	1,770	2,310
13	4,960	4,810	5,850	3,610	4,130	27,300	6,300	1,620	1,640	2,560	1,570	1,880
14	4,450	4,580	5,530	3,910	4,050	36,500	9,030	1,670	1,690	2,160	1,440	1,770
15	4,250	4,560	5,350	4,250	3,850	52,900	7,510	1,890	1,600	2,040	1,760	2,020
16	3,890	5,460	5,240	5,530	3,650	60,100	6,330	2,070	1,670	1,710	1,600	1,980
17	3,530	6,170	4,890	15,900	3,480	65,800	7,220	2,070	1,590	1,550	1,760	2,050
18	3,850	17,400	4,750	26,800	3,610	52,200	9,860	1,930	1,570	1,510	1,740	2,160
19	3,910	28,900	4,470	23,500	3,420	31,000	19,300	1,820	1,400	1,540	1,710	2,230
20	3,850	26,900	4,330	20,100	3,320	21,000	21,100	2,020	1,540	2,950	1,570	2,220
21	5,350	16,700	4,190	14,900	3,290	15,500	20,900	1,890	1,470	3,940	1,600	2,090
22	29,200	14,800	4,130	11,500	3,460	12,100	8,900	2,320	1,400	3,190	1,600	2,000
23	25,000	13,600	4,110	10,000	4,330	8,900	7,460	2,680	1,520	4,980	1,570	1,660
24	18,200	12,000	3,930	9,600	4,250	7,180	7,320	2,040	1,430	3,670	1,710	3,190
25	15,100	11,300	3,690	10,400	5,040	6,950	6,810	1,860	1,380	2,950	1,720	3,390
26	10,100	9,730	3,510	9,110	6,340	6,720	4,400	1,840	1,250	3,050	1,710	3,790
27	8,100	8,840	3,500	8,050	5,990	6,540	4,100	1,930	1,270	2,600	1,510	3,590
28	7,040	7,640	3,460	7,580	4,500	6,510	3,610	1,770	1,280	2,360	1,720	4,060
29	6,700	.....	3,340	7,740	4,250	6,400	3,170	1,600	1,220	2,130	1,710	4,120
30	6,560	.....	3,500	7,580	3,690	5,990	2,850	1,410	1,070	2,250	1,880	4,250
31	6,410	.....	3,320	.....	3,320	.....	2,700	1,670	.....	2,130	.....	4,500

NOTE.—These discharges were obtained as follows: Jan. 1 to June 20, from a rating curve which is well defined below 25,800 second-feet; above this the curve has been extended by a study of the area and velocity curves. June 21 to Dec. 31, from a well-defined rating curve.

Monthly discharge of James River at Cartersville, Va., for 1910.

[Drainage area, 6,230 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	29,200	2,040	7,450	1.20	1.38	A
February	28,900	4,560	9,430	1.51	1.57	A
March	23,600	3,320	7,690	1.23	1.42	A
April	26,800	3,040	8,060	1.29	1.44	A
May	7,360	3,290	4,500	.722	.83	A
June	65,800	2,580	16,000	2.57	2.87	B
July	21,100	2,700	7,490	1.20	1.38	A
August	3,010	1,410	2,000	.321	.37	A
September	3,030	1,070	1,770	.284	.32	A
October	7,960	1,080	2,580	.414	.48	A
November	2,790	1,440	1,830	.294	.33	A
December	4,500	1,660	2,530	.406	.47	A
The year	65,800	1,070	5,900	.947	12.86	

ROANOKE RIVER BASIN.

DESCRIPTION.

Roanoke River is formed by the North and South forks, which rise among the eastern foothills of the Appalachian Mountains and unite near Lafayette, at the eastern edge of Montgomery County, Va. From this junction the river flows in a general southeasterly direction, across the northeast corner of North Carolina, and empties into the Atlantic through Albemarle Sound. The total drainage area is about 9,200 square miles. The section of river extending from a short distance below Roanoke to the junction of the Dan is known locally as Staunton River and was so called in the reports of the United States Geological Survey prior to 1905.

Dan River, which rises in Surry County, N. C., and Patrick County, Va., and empties into the Roanoke near Clarksville, in the southwestern part of Mecklenburg County, Va., is by far the largest tributary, the other streams of the basin being relatively small and unimportant.

The drainage basin of the Roanoke is divided into two nearly equal parts by the fall line, which crosses the river between Weldon and Gaston. The eastern part, known as the Coastal Plain, is built up of unconsolidated sands, gravels, loams, clays, and marls of recent geologic age. It is low and flat and so poorly drained that a large proportion of the area is swampy. The general slope of this section of the basin is from 1 to 3 feet per mile. The river is sluggish and is navigable by light-draft boats at all seasons as far west as Weldon. Above the fall line, in the region known as the Piedmont Plateau, the country is more broken and the river has greater fall, having cut its bed down to the underlying metamorphic rocks. Building stones are found in abundance in different sections. Along the river are many fine bottoms, which contain some of the best farming lands in the region. The surface is undulating, and the hills become higher toward the western margin. Altitudes within the basin range from sea level to 3,000 feet above.

The Coastal Plain section of the area is heavily forested, and large quantities of timber and shingles are shipped. In the Piedmont Plateau area the extent of forest covering has not been ascertained except in the area drained by the Dan, in which there are extensive timbered areas.

The mean annual rainfall for the drainage basin in the Piedmont Plateau ranges from 38 to 47 inches in different parts of the area, as determined from six Weather Bureau stations having records of 5 to 16 years in length. In the Coastal Plain section the rainfall is somewhat greater, increasing toward the coast line.

This drainage area of the Roanoke lies so far south that the flow of the stream is relatively little affected by ice.

The area contains no lakes, but owing to the hilly character of the upper basin sites for reservoirs of moderate capacity probably exist. Especially is this true for the portion of the basin drained by Dan River, where the river bed is solid rock overlain with sands and gravel between the rapids, affording excellent facilities for dams.

In 1905 a survey of Roanoke River was made by the United States Geological Survey from Roanoke, Va., to Weldon, N. C. This survey showed that the fall between the two points was 976 feet in a distance of 231 miles, or an average of 4.2 feet per mile.

The United States Geological Survey has maintained records of flow in this basin since 1896, and the records compiled since that date show the year of greatest run-off to be 1901 and that of least run-off 1904. The total flow in the latter year was less than half that of the former. The region is subject to heavy rainstorms, which produce floods that rise very rapidly and subside as quickly.

The following special reports contain information regarding the surface waters of the Roanoke River basin:

Hydrography of Virginia: Bull. Geol. Survey Virginia No. 3, 1906, pp. 163–213 (published by Virginia Board of Agriculture and Immigration, Richmond, Va.). This contains all records and discharge data collected in the Roanoke basin prior to 1906, revised by engineers of the United States Geological Survey.

Water power in North Carolina: Bull. North Carolina Geol. Survey No. 8; postage 16 cents. This publication includes information regarding the water power of the Roanoke and its tributaries in North Carolina.

Water powers of North Carolina: Bull. North Carolina Geol. Survey (in preparation), Dr. J. H. Pratt, State geologist, Chapel Hill, N. C. This includes all records of discharge in the Roanoke basin prior to 1908, collected by engineers of the United States Geological Survey, except for Roanoke River at Roanoke, Tinker Creek at Roanoke, Back Creek near Roanoke, and Banister River at Houston.

Relation of southern Appalachian Mountains to the development of inland water navigation and water power: U. S. Forest Service Circulars Nos. 143 and 144.

ROANOKE RIVER AT ROANOKE, VA.

This station was established July 10, 1896, at the Walnut Street Bridge in Roanoke. Observation of gage heights was discontinued July 14, 1906, but was resumed May 7, 1908, and the records are now being furnished to the United States Geological Survey through the courtesy of the Roanoke Railway & Electric Co.

The nearest important tributary, Tinker Creek, enters Roanoke River about 3 miles below the gaging section. The overflow from Crystal Spring, which is approximately 2 second-feet, enters the Roanoke between Walnut Street Bridge, where the chain gage is located, and Jefferson Street Bridge, one-third mile above, where

discharge measurements are usually made. Crystal Spring is the source of water supply for the city of Roanoke.

The records indicate that the discharge is not materially affected by ice.

No change has been made in the datum of the gage. Owing to varying conditions of flow frequent measurements are required at low stages to adequately define the true discharge curve from year to year.

The following discharge measurement was made by G. C. Stevens:

September 6: Width, 130 feet; area of section, 229 square feet; gage height, 1.24 feet; discharge, 278 second-feet.

Daily gage height, in feet, of Roanoke River at Roanoke, Va., for 1910.

[C. C. Hogshead, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.45	0.9	1.6	0.9	1.2	1.1	1.3	1.1	1.3	0.7	0.8	0.75
2	.6	1.1	2.85	.95	1.15	.95	1.35	1.05	1.25	.75	.8	.7
3	.9	1.2	2.1	.95	1.1	.9	1.25	1.05	1.35	.75	.75	.65
4	.9	1.4	2.0	1.1	1.15	.85	1.25	1.1	1.35	.7	.8	.7
5	.95	1.45	1.9	1.15	1.1	1.0	2.0	1.0	1.5	.75	.7	.75
6	.8	1.1	1.9	1.05	1.1	1.25	1.45	1.05	1.25	.7	.75	.9
7	1.3	1.35	1.85	1.1	1.1	1.0	1.85	.95	1.05	.85	.75	1.0
8	1.75	1.4	1.7	1.05	1.1	1.0	1.55	.95	1.05	1.25	.7	.85
9	1.5	1.3	1.6	.95	1.25	1.05	2.0	1.0	.95	1.65	.7	.9
10	1.25	1.25	1.6	1.0	1.15	1.25	1.9	.9	.95	1.2	.65	.85
11	1.15	1.1	1.5	.95	1.2	2.4	1.75	.95	.9	1.05	.7	.85
12	1.0	1.1	1.4	1.0	1.15	3.05	1.3	.9	.85	1.0	.7	.85
13	1.05	1.0	1.4	1.15	1.1	7.75	1.4	.9	.9	1.0	.65	.8
14	1.0	1.0	1.3	1.1	1.1	6.25	1.9	.9	.85	.85	.7	.85
15	.9	1.15	1.25	1.15	1.05	3.5	1.9	.85	.95	.9	.65	.8
16	.85	1.3	1.2	1.05	1.05	4.3	1.75	.9	.85	.85	.7	.75
17	.9	2.0	1.15	1.15	1.05	3.25	1.9	.8	.85	.85	.7	.75
18	.95	4.6	1.2	1.7	.95	2.7	4.25	.8	.85	.85	.65	7
19	1.0	2.55	1.2	1.55	1.0	2.25	2.35	.9	.75	.8	.65	.8
20	1.0	1.95	1.15	1.55	.9	2.0	2.0	1.0	.8	.9	.6	.7
21	1.85	1.9	1.15	1.45	1.0	1.9	1.75	.9	.75	.85	.65	.4
22	2.1	1.9	1.1	1.5	1.0	2.1	1.5	.85	.75	.9	.7	.5
23	1.9	1.85	1.1	1.45	1.0	2.05	1.35	.8	.8	.9	.65	.7
24	1.6	1.8	1.1	1.35	1.15	1.95	1.35	.85	.75	.85	.7	.9
25	1.5	1.65	1.05	1.3	1.4	2.45	1.3	.8	.8	.9	.65	.95
26	1.25	1.65	1.0	1.25	1.25	2.0	1.25	.85	.8	.85	.7	.95
27	1.2	1.6	.95	1.25	1.25	1.55	1.2	.95	.8	.9	.7	.95
28	1.2	1.45	1.0	1.25	1.2	1.9	1.15	.9	.8	.9	.7	.85
29	1.1	.....	.95	1.15	1.25	1.45	1.1	.95	.75	.8	.75	.9
30	1.0	.....	.95	1.2	1.15	1.4	1.15	.85	.....	.85	.7	1.2
31	.95	.....	.95	.....	1.15	.....	1.05	1.0	.....	.75	.....	1.4

NOTE.—The flow was probably retarded by freezing conditions on Jan. 1 and 2 and Dec. 21 and 22.

Daily discharge, in second-feet, of Roanoke River at Roanoke, Va., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	60	136	430	136	237	200	310	224	310	96	122	109
2	80	200	1,490	151	218	151	335	205	287	109	122	96
3	136	237	770	151	200	136	287	205	335	109	109	85
4	136	326	690	200	218	123	287	224	335	96	122	96
5	151	351	620	218	200	166	725	186	415	109	96	109
6	110	200	620	183	200	258	388	205	287	96	109	152
7	279	302	585	200	200	166	622	169	205	137	109	186
8	519	326	488	183	200	166	442	169	205	287	96	137
9	376	279	430	151	258	183	725	186	169	500	96	152
10	258	258	430	166	218	258	655	152	169	264	85	137
11	218	200	376	151	237	1,030	560	169	152	205	96	137
12	166	200	326	166	218	1,720	310	152	137	186	96	137
13	183	166	326	218	200	7,970	360	152	152	186	85	122
14	166	166	279	200	200	5,940	655	152	137	137	96	137
15	136	218	258	218	183	2,260	655	137	169	152	85	122
16	123	279	237	183	183	3,310	560	152	137	137	96	109
17	136	690	218	218	183	1,960	655	122	137	137	96	109
18	151	3,720	237	488	151	1,340	3,240	122	137	137	85	96
19	166	1,180	237	403	166	920	1,000	152	109	122	85	122
20	166	655	218	403	136	725	725	186	122	152	74	96
21	585	620	218	351	166	655	560	152	109	137	85	96
22	770	620	200	376	166	800	415	137	109	152	96	96
23	620	585	200	351	166	762	335	122	122	152	85	96
24	430	550	200	302	218	690	335	137	109	137	96	152
25	376	459	183	279	326	1,100	310	122	122	152	85	169
26	258	459	166	258	258	725	287	137	122	137	96	169
27	237	430	151	258	258	442	264	169	122	152	96	169
28	237	351	166	258	237	655	244	152	122	152	96	137
29	200	.....	151	218	258	388	224	169	109	122	109	152
30	166	.....	151	237	218	360	244	137	102	137	96	264
31	151	.....	151	.....	218	.....	205	186	.....	109	.....	360

NOTE.—These discharges were obtained from two well-defined rating curves, one applicable from Jan. 1 to June 13 and the other from June 14 to Dec. 31. Discharge on Jan. 1 and 2 and Dec. 21 and 22 estimated because of probable effect of ice above the station.

Monthly discharge of Roanoke River at Roanoke, Va., for 1910.

[Drainage area, 388 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	770	[1] 60	250	0.644	0.74	B
February	3,720	136	506	1.30	1.35	A
March	1,490	151	361	.930	1.07	A
April	488	136	242	.624	.70	A
May	326	136	210	.541	.62	A
June	7,970	123	1,190	3.07	3.42	B
July	3,240	205	546	1.41	1.63	A
August	224	122	163	.420	.48	A
September	415	[1] 102	175	.451	.50	A
October	500	96	158	.407	.47	A
November	122	74	96.7	.249	.28	A
December	360	85	139	.358	.41	B
The year	7,970	[1] 60	334	.861	11.67	

[1] Estimated.

YADKIN OR PEDEE RIVER BASIN.

DESCRIPTION.

Yadkin River, called Pedee River below the junction with the Uharie, rises on the eastern slope of the Blue Ridge in Caldwell, Watauga, and Wilkes counties, N. C., and flows in a general southeasterly direction across North Carolina and South Carolina, emptying into the Atlantic through Winyah Bay at Georgetown, S. C. The length of the stream from source to mouth by general course is about 300 miles, and the drainage area comprises about 10,600 square miles. The head of navigation is at Cheraw, S. C., about 149 miles above its mouth.

The river has no tributaries which compare with it in size. The larger of the tributaries are Little Pedee and Lynches rivers in South Carolina and South Yadkin River in North Carolina.

The upper part of the drainage basin is in the Appalachian Mountains proper and is largely forest covered. The extreme upper portion of the basin reaches an elevation of 3,000 feet, but the streams fall rapidly to 1,500 feet elevation and reach 1,000 feet elevation above Wilkesboro, N. C. From Wilkesboro down to the fall line, near Cheraw, S. C., the basin lies in the Piedmont Plateau. Above the fall line the rocks consist of various granites, gneisses, and schists; below the fall line these pass beneath the much younger sedimentary deposits of the Coastal Plain.

Ice and snow occur in noteworthy amounts only in the higher parts of the basin, but even there they do not affect the stream flow to any appreciable degree. The average rainfall for the basin is 50 to 60 inches in the upper portion and 45 to 50 inches in the lower portion. Storage is possible at a number of places, but owing to steep slopes of the streams especially good sites are probably lacking.

In North Carolina the main stream and many of its tributaries afford a great amount of power, much of which has been developed.

The following special reports contain information regarding the hydrography of the Yadkin River basin.:

Water power in North Carolina: Bull. North Carolina Geol. Survey No. 8, pp. 172–203; postage, 16 cents.

Water powers of North Carolina (in preparation): Bull. North Carolina Geol. Survey, J. H. Pratt, State geologist, Chapel Hill, N. C. This report contains all records of discharge collected in the Yadkin River basin prior to 1908 by engineers of the United States Geological Survey.

Relation of southern Appalachian Mountains to the development of inland water navigation and water power: U. S. Forest Service Circulars Nos. 143 and 144.

Hydrography of the southern Appalachian Mountain region, part 2, by H. A. Pressey, 1902: Water-Supply Paper U. S. Geol. Survey No. 63. The Geological Survey has no copies of this paper for free distribution, but the report may be purchased (price, 15 cents) from the Superintendent of Documents, Washington, D. C.

YADKIN RIVER NEAR PEDEE, N. C.

This station is located near Pedee, N. C., about 1,500 feet below the dam of the Rockingham Power Co. A vertical gage was installed August 9, 1906, by the engineers of the power company, for the purpose of keeping daily records of river height at the power site, and the record has been maintained continuously since that time. Except for the discharge measurement made on November 13, 1908, all the measurements in 1908, 1909, and 1910 were made and furnished by the power company. Gage heights have been furnished by the company since August 9, 1906.

The measurements are made from a ferryboat at the ferry, a short distance below the gage. The section is somewhat rough and irregular but is better than any other near-by section which was examined. The extreme low portion of the rating curve is uncertain, as it is not covered by measurements.

Discharge measurements of Yadkin River near Pedee, N. C., in 1910.

Date.	Hydrographer.	Area of section.	Gage height.	Discharge.
		Sq. ft.	*Feet.*	*Sec.-ft.*
May 3	W. S. Ide	3,910	87.57	3,260
June 2	do	3,670	87.20	2,830
Aug. 2	do	3,610	87.22	3,020

Daily gage height, in feet, of Yadkin River near Pedee, N. C., for 1910.

[W. S. Ide, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	87.2	90.2	91.5	87.75	87.7	87.3	87.85	87.2	88.4	87.2	87.15	87.15
2	87.15	89.5	98.25	87.75	87.6	87.25	87.95	87.2	93.1	87.2	87.25	87.15
3	87.4	89.05	96.4	87.8	87.6	87.15	87.65	87.25	94.3	87.2	87.25	87.15
4	88.15	88.8	92.9	87.9	87.4	87.1	87.55	88.15	93.3	87.2	87.25	87.05
5	87.8	88.75	90.85	87.9	87.45	87.05	87.5	88.7	91.1	87.25	87.3	87.05
6	87.6	88.55	90.3	87.9	87.35	87.35	87.5	88.5	91.3	87.25	87.35	87.45
7	87.6	88.3	90.5	87.75	87.35	87.75	88.4	90.25	89.8	87.3	87.3	89.4
8	87.65	88.2	89.9	87.65	88.15	87.75	88.5	90.05	88.8	88.5	87.25	90.1
9	88.4	88.3	89.25	87.7	92.4	87.7	88.4	88.55	88.5	91.2	87.25	89.05
10	88.65	88.65	88.95	87.55	91.0	87.5	88.75	88.35	88.8	94.0	87.25	88.25
11	88.0	88.7	88.85	87.5	90.2	89.4	89.05	87.9	89.15	90.5	87.25	87.8
12	87.65	91.9	89.4	87.55	89.15	89.5	89.05	87.4	88.55	89.6	87.25	87.55
13	87.5	91.35	90.3	87.5	88.45	91.25	88.8	87.35	88.15	88.75	87.2	87.6
14	87.6	90.15	89.65	87.55	88.1	94.2	88.9	87.55	87.75	88.25	87.15	87.35
15	87.75	89.5	89.15	88.0	87.9	100.3	90.35	87.4	87.7	87.95	87.1	87.35
16	87.65	89.5	88.75	88.15	87.7	98.5	92.2	87.6	87.7	87.7	87.15	87.25
17	87.55	89.95	88.6	87.95	87.6	93.4	90.4	87.4	87.5	87.65	87.2	87.35
18	87.55	92.6	88.4	89.6	87.55	91.25	89.25	87.25	87.3	87.5	87.2	87.35
19	87.55	94.55	88.4	89.75	87.5	89.8	89.55	87.2	87.2	87.45	87.15	87.25
20	87.9	91.4	88.3	89.2	87.65	89.05	89.15	87.25	87.2	88.15	87.15	87.25
21	88.35	90.7	88.25	88.5	87.8	89.35	88.45	87.1	87.2	88.5	87.1	87.4
22	92.2	91.25	88.25	88.2	87.75	89.1	87.95	87.05	87.2	88.35	87.15	87.35
23	91.95	91.25	88.2	88.0	87.8	88.6	87.75	89.50	87.15	88.1	87.2	87.25
24	90.35	90.55	88.2	87.85	87.85	88.6	87.55	89.40	87.2	87.65	87.15	87.4
25	89.6	90.25	88.1	87.8	87.85	88.35	87.5	88.0	87.15	87.55	87.15	88.4
26	89.5	89.9	88.0	87.8	88.0	88.55	87.4	87.7	87.1	87.4	87.15	89.2
27	88.9	89.45	88.0	87.8	88.35	88.7	87.4	87.85	87.1	87.35	87.15	88.6
28	88.7	82.25	88.0	88.0	88.15	88.7	88.2	87.75	87.1	87.3	87.05	88.25
29	93.95	.....	87.9	88.05	87.8	87.95	88.05	87.6	87.05	87.3	87.1	87.8
30	92.95	.....	87.8	87.85	87.5	87.7	87.65	87.55	87.1	87.2	87.15	87.85
31	90.95	.....	87.85	.....	87.3	.....	87.25	87.45	.....	87.25	.....	88.3

Daily discharge, in second-feet, of Yadkin River near Pedee, N. C., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,900	9,900	13,400	4,020	3,920	3,100	4,240	2,900	5,470	2,900	2,800	2,800
2	2,800	8,100	.....	4,020	3,710	3,000	4,460	2,900	.....	2,900	3,000	2,800
3	3,300	7,000	.....	4,130	3,710	2,800	3,820	3,000	.....	2,900	3,000	2,800
4	4,900	6,400	.....	4,350	3,300	2,700	3,600	4,900	.....	2,900	3,000	.....
5	4,130	6,280	11,600	4,350	3,400	.....	3,500	6,160	12,300	3,000	3,100	.....
6	3,710	5,820	10,200	4,350	3,200	3,200	3,500	5,700	12,800	3,000	3,200	3,400
7	3,710	5,240	10,700	4,020	3,200	4,020	5,470	10,000	8,860	3,100	3,100	7,850
8	3,820	5,010	9,120	3,820	4,900	4,020	5,700	9,510	6,400	5,700	3,000	9,640
9	5,470	5,240	7,480	3,920	.....	3,920	5,470	5,820	5,700	12,500	3,000	7,000
10	6,040	6,040	6,760	3,600	12,000	3,500	6,280	5,360	6,400	.....	3,000	5,120
11	4,570	6,160	6,520	3,500	9,900	7,850	7,000	4,350	7,240	10,700	3,000	4,130
12	3,820	14,400	7,850	3,600	7,240	8,100	7,000	3,300	5,820	8,350	3,000	3,600
13	3,500	12,900	10,200	3,500	5,580	12,700	6,400	3,200	4,900	6,280	2,900	3,710
14	3,710	9,770	8,480	3,600	4,790	.....	6,640	3,600	4,020	5,120	2,800	3,200
15	4,020	8,100	7,240	4,570	4,350	.....	10,300	3,300	3,920	4,460	2,700	3,200
16	3,820	8,100	6,280	4,900	3,920	.....	.....	3,710	3,920	3,920	2,800	3,000
17	3,600	9,250	5,930	4,460	3,710	.....	10,400	3,300	3,500	3,820	2,900	3,200
18	3,600	.....	5,470	8,350	3,600	12,700	7,480	3,000	3,100	3,500	2,900	3,200
19	3,600	.....	5,470	8,730	3,500	8,860	8,220	2,900	2,900	3,400	2,800	3,000
20	4,350	13,100	5,240	7,360	3,820	7,000	7,260	3,000	2,900	4,900	2,800	3,000
21	5,360	11,200	5,120	5,700	4,130	7,720	5,580	2,700	2,900	5,700	2,700	3,300
22	.....	12,700	5,120	5,010	4,020	71,120	4,460	.....	2,900	5,360	2,800	3,200
23	14,600	12,700	5,010	4,570	4,130	5,930	4,020	8,100	2,800	4,790	2,900	3,000
24	10,300	10,800	5,010	4,240	4,240	5,930	3,600	7,850	2,900	3,820	2,800	3,300
25	8,350	10,000	4,790	4,130	4,240	5,360	3,500	4,570	2,800	3,600	2,800	5,470
26	8,100	9,120	4,570	4,130	4,570	5,820	3,300	3,920	2,700	3,300	2,800	7,360
27	6,640	7,980	4,570	4,130	5,360	6,160	3,300	4,240	2,700	3,200	2,800	5,930
28	6,160	.....	4,570	4,570	4,900	6,160	5,010	4,020	2,700	3,100	.....	5,120
29	.....	.....	4,350	4,680	4,130	4,460	4,680	3,710	.....	3,100	2,700	4,130
30	.....	.....	4,130	4,240	3,500	3,920	3,820	3,600	2,700	2,900	2,800	4,240
31	11,800	.....	4,240	.....	3,100	.....	3,000	3,400	.....	3,000	.....	5,240

NOTE.—These discharges are based on a rating curve which is fairly well defined between 3,300 and 13,400 second-feet. Discharges for all missing days were greater than 14,700 second-feet. Below 3,000 second-feet the discharges are only approximate.

PEDEE RIVER AT CHERAW, S. C.

This station, which is located at the highway bridge at Cheraw, about half a mile below the bridge of the Seaboard Air Line Railway, was established by the United States Weather Bureau April 1, 1891. The first discharge measurements by the United States Geological Survey were made during 1909.

Although the flood of August, 1908, had destroyed the gage, it was thought possible that the original gage datum could be preserved and a rating made which would apply for some of the previous years. A temporary gage was used until the new vertical gage attached to the new bridge pier was put into use on November 3, 1909. The low-water section of the temporary gage was so defective and variable that is is impossible to adjust the readings from it to the datum of the new gage, which is presumably on the original gage datum. The records from August 28, 1908, to November 2, 1909, therefore, can not be supplied. The gage heights are furnished by the United States Weather Bureau.

Before the installation of the new gage, discharge measurements were made at the railroad bridge, and by means of reference points have been correctly adjusted to the present gage datum.

Conditions of flow appear fairly good, but no rating has yet been developed.

Discharge measurements of Pedee River at Cheraw, S. C., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 17	E. H. Sweet	325	4,780	7.35	9,990
18	do	333	5,320	9.18	12,600

Daily gage height, in feet, of Pedee River at Cheraw, S. C., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	10.8	7.1	2.7	2.8	2.0	2.5	2.0	3.2	1.6	1.6	1.6
2	2.3	7.7	24.2	2.7	2.7	1.9	2.3	1.8	5.8	1.8	1.6	1.5
3	2.1	5.6	28.1	2.6	2.5	1.6	2.5	2.0	20.0	1.8	1.5	1.4
4	1.9	5.0	24.5	2.5	2.4	1.4	2.6	1.9	19.3	1.6	1.6	1.4
5	2.8	5.2	17.5	2.5	2.4	1.2	2.4	1.7	16.2	1.5	1.8	1.5
6	3.2	4.9	11.9	2.6	2.2	2.0	2.1	1.7	12.2	1.5	2.0	1.8
7	2.8	4.2	8.2	2.7	2.0	2.8	2.0	4.3	9.6	1.6	1.9	2.1
8	2.4	3.9	8.8	2.8	2.0	3.1	2.0	7.0	7.4	1.8	1.9	4.3
9	2.7	3.3	8.0	2.7	9.0	2.7	3.7	6.0	5.0	6.5	1.8	7.5
10	3.2	3.6	5.9	2.6	13.8	3.3	4.0	4.2	3.8	15.7	1.8	6.2
11	4.7	4.7	4.6	2.5	10.2	5.3	4.1	3.4	4.4	16.7	1.7	3.8
12	3.4	9.7	4.9	2.4	6.8	7.0	4.6	2.8	4.5	9.9	1.6	2.7
13	2.8	13.0	7.8	2.3	4.7	10.2	5.5	2.5	4.0	6.0	1.6	2.3
14	2.4	11.6	8.7	2.3	3.5	14.2	4.8	2.1	3.2	4.2	1.5	2.2
15	2.3	9.8	7.6	2.5	3.1	28.4	5.2	2.5	2.9	3.3	1.5	2.1
16	2.4	6.7	5.4	2.6	2.9	31.8	9.1	2.2	2.6	2.8	1.5	2.0
17	2.5	5.0	4.8	2.7	2.8	28.7	12.3	2.0	2.4	2.5	1.4	1.9
18	2.3	7.3	4.0	3.4	2.7	21.8	7.5	2.2	2.2	2.3	1.4	1.8
19	2.4	19.6	3.9	7.2	2.5	14.9	5.2	2.0	2.1	2.1	1.4	2.0
20	2.5	20.3	3.8	6.4	2.4	9.1	4.4	1.8	2.0	2.9	1.4	2.3
21	2.6	17.6	3.7	4.9	2.3	6.0	6.0	1.7	1.9	4.2	1.3	2.2
22	6.4	11.8	3.6	4.0	2.7	6.2	4.2	1.7	1.8	4.0	1.3	2.1
23	13.7	12.5	3.5	3.4	2.8	5.0	3.3	1.6	1.7	3.4	1.3	2.0
24	12.0	12.2	3.5	3.0	2.6	3.9	2.6	1.6	1.7	3.4	1.3	2.0
25	7.6	9.9	3.4	2.9	2.6	3.4	2.2	1.5	1.6	2.9	1.2	3.2
26	6.5	10.0	3.3	2.8	2.8	3.3	2.0	4.3	1.6	2.7	1.2	4.6
27	5.4	8.8	3.1	2.7	3.0	3.1	2.0	3.2	1.6	2.5	1.2	4.4
28	4.7	8.0	3.0	2.9	2.7	2.9	2.3	2.8	1.5	2.2	1.2	4.7
29	7.8	.....	2.9	2.9	2.4	2.6	3.5	2.5	1.5	1.9	1.4	4.5
30	20.2	.....	2.8	2.7	2.3	2.4	3.1	2.2	1.4	1.8	1.7	3.2
31	15.0	.....	2.8	.....	2.1	.....	2.1	2.6	.....	1.7	.....	3.5

SANTEE RIVER BASIN.

DESCRIPTION.

Santee River, which is formed by Congaree and Wateree rivers, drains a large area extending from the Blue Ridge in western North Carolina through the central portion of South Carolina to the Atlantic Ocean. The total length of the basin, measured in the general direction of the course of the river, is about 300 miles.

Wateree River, the more northerly of the two streams, rises on the eastern slope of the Blue Ridge in McDowell County, N. C., and flows first eastward, then southeastward across North Carolina and a portion of South Carolina to its junction with the Congaree. In North Carolina and also in that part of its course in South Carolina above Wateree Creek, it is known as Catawba River.

The Congaree is formed by the junction of Broad and Saluda rivers at Columbia, S. C., whence it flows in a southeasterly direction for about 60 miles to its junction with the Wateree. Broad River rises on the eastern slope of the Blue Ridge in McDowell and Henderson counties, N. C., and Saluda River rises in Pickens and Greenville counties, S. C.

The upper portion of the basin is mountainous, its extreme elevation being 3,000 to 5,000 feet in the Catawba basin and 2,000 to 3,000 feet in the areas drained by Broad and Saluda rivers. These upper portions, even to elevations much below 2,000 feet, are largely covered with forests, but the greater part of the area is an agricultural section where much of the land is under cultivation. As in the Yadkin River basin, the areas lying above the fall line—the mountain and Piedmont Plateau portions—are made up of various granite, gneisses, and schists, which pass below the much younger sedimentary deposits of the Coastal Plain a short distance below Columbia, S. C.

Snow and ice have little effect on stream flow and the operation of gaging stations in this region. The average annual rainfall ranges from 45 inches in the central and lower portions to 60 inches near the headwaters. In general, the storage opportunities of this basin appear somewhat meager on account of the steep slopes and narrow valleys by which it is characterized.

Excellent water-power sites are found everywhere above the fall line, which passes near Camden and Columbia, S. C., and many large powers have already been developed.

The following special reports contain information regarding the hydrography of the Santee River basin:

Water power in North Carolina: Bull. North Carolina Geol. Survey No. 8 (postage 16 cents).

Water powers of North Carolina (in preparation): Bull. North Carolina Geol. Survey, Dr. J. H. Pratt, State geologist, Chapel Hill, N. C. This report will contain all records of discharge collected in the Santee River basin prior to 1908 by engineers of the United States Geological Survey.

Relation of southern Appalachian Mountains to the development of inland water navigation and water powers: U. S. Forest Service Circulars Nos. 143 and 144.

Hydrography of the southern Appalachian Mountain region, part 2, by H. A. Pressey, 1902: Water-Supply Paper U. S. Geol Survey No. 63. This publication is no longer available for free distribution but may be purchased (price 15 cents) from the Superintendent of Documents, Washington, D. C.

River surveys and profiles made during 1903, by W. C. Hall and J. C. Hoyt: Water-Supply Paper U. S. Geol. Survey No. 115. This report and separate sheets showing the Catawba and Broad River profiles may be obtained by applying to the Director of the United States Geological Survey, Washington, D. C.

WATEREE RIVER NEAR CAMDEN, S. C.

This station has been maintained by the United States Weather Bureau since 1891 at the toll bridge about 2 miles west of Camden.

Camden is located about 45 miles above the mouth of Wateree River and about 5 miles below the fall line. The United States Geological Survey has published records of discharge since August 12, 1904.

The United States Weather Bureau gage was in three sections, of which only the one reading from 15 to 32 feet, painted on the upstream cylindrical pier on the right bank, was in good condition up to 1908. On August 12, 1904, a chain gage was installed on the bridge at the same datum as the upper section of the United States Weather Bureau gage.

The flood of August, 1908, washed out the bridge and both the United States Geological Survey chain gage and the United States Weather Bureau vertical staff gage. This last gage was replaced September 1, 1908, at presumably the same datum, by repainting it on a pier that was left standing at the opposite end of the bridge. The exact datum of this new gage has not been accurately determined. For low and ordinary stages a temporary short section is used, which has been subject to some change in location and possibly in datum.

Some uncertainty exists regarding the datum to which the gage heights were referred prior to the establishment of the chain gage in August, 1904. Very little shift in the river bed has occurred since discharge measurements have been made at this point up to the time of the flood in August, 1908. Measurements since that time, made at the railroad bridge about half a mile above, indicate a great amount of change, which possibly may be due to change in the datum of the gage.

Both banks are high but are liable to overflow at extreme high water. The river below the station has a very small slope, which is unfavorable for good rating at high stages, as the position of the flood crest will greatly affect the slope. The high part of the curve has been somewhat modified to give a greater discharge for high stages.

The river is subject to power regulation above the station, which probably affects the daily mean gage heights considerably, especially during low water.

The station was discontinued June 30, 1910.

Discharge measurements of Wateree River near Camden, S. C., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 15	E. H. Swett	362	5,130	9.85	5,570
Feb. 16	do	355	4,420	7.86	2,720

NOTE.—Measurements made from railroad bridge about one-half mile above the regular section.

Daily gage height, in feet, of Wateree River near Camden, S. C., for 1910.

[H. Arthur Brown, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	5.9	11.6	14.1	7.4	5.4	6.7	16	4.5	8.6	9.0	6.7	6.6	26.2
2	5.5	8.8	25.8	7.9	6.0	6.3	17	6.0	9.3	8.1	7.8	7.3	23.0
3	5.45	8.5	25.1	6.0	6.0	7.2	18	4.9	13.4	8.2	6.6	7.8	19.4
4	6.2	7.9	20.6	6.1	6.2	6.7	19	6.1	15.2	7.4	7.6	7.2	16.4
5	6.6	7.2	16.8	6.6	7.2	5.75	20	6.9	19.8	6.0	6.8	7.9	15.6
6	6.1	6.8	12.2	7.1	6.4	7.6	21	6.8	15.8	6.0	6.6	7.7	12.2
7	5.75	7.3	10.4	7.0	5.95	8.3	22	8.0	16.4	7.9	7.2	6.2	10.7
8	5.3	7.8	10.6	6.3	5.35	7.4	23	10.6	14.8	6.8	6.4	7.1	9.9
9	5.0	7.9	10.3	6.4	10.5	7.1	24	10.8	18.3	6.4	6.1	7.1	10.0
10	6.9	8.9	8.5	5.4	14.8	8.6	25	8.6	21.2	7.0	6.1	8.9	10.7
11	9.2	9.3	9.0	5.7	13.2	8.7	26	8.4	24.3	7.5	7.2	8.7	9.6
12	5.3	14.2	8.6	6.8	12.4	9.0	27	7.3	10.8	7.4	6.8	8.1	9.8
13	6.2	14.2	9.1	7.8	10.8	14.0	28	9.1	11.3	6.8	6.5	7.1	8.6
14	7.2	12.3	9.5	7.4	7.4	20.4	29	20.2	.....	6.7	5.75	5.75	9.2
15	6.7	10.4	10.0	6.3	5.7	27.1	30	16.7	.....	6.6	6.1	6.3	9.6
							31	14.8	.....	7.3	.....	6.5	.....

Daily discharge, in second-feet, of Wateree River near Camden, S. C., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Date.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	1,900	7,330	10,100	3,210	1,470	2,580	16	760	4,290	4,690	2,580	2,490	27,400
2	1,560	4,490	26,800	3,660	1,980	2,240	17	1,980	4,990	3,840	3,570	3,120	22,300
3	1,510	4,200	25,700	1,980	1,980	3,030	18	1,070	9,310	3,930	2,490	3,570	17,000
4	2,150	3,660	18,700	2,060	2,150	2,580	19	2,060	11,400	3,210	3,390	3,030	13,000
5	2,490	3,030	13,500	2,490	3,030	1,770	20	2,760	17,600	1,980	2,670	3,660	11,900
6	2,060	2,670	7,990	2,940	2,320	3,390	21	2,670	12,200	1,980	2,490	3,480	7,990
7	1,770	3,120	6,090	2,850	1,940	4,020	22	3,750	13,000	3,660	3,030	2,150	6,390
8	1,390	3,570	6,290	2,240	1,430	3,210	23	6,290	11,000	2,670	2,320	2,940	5,590
9	1,150	3,660	5,990	2,320	6,190	2,940	24	6,490	15,500	2,320	2,060	2,940	5,690
10	2,760	4,590	4,200	1,470	11,000	4,290	25	4,290	19,600	2,850	2,060	4,590	6,390
11	4,890	4,990	4,690	1,720	9,090	4,390	26	4,110	10,400	3,300	3,030	4,390	5,290
12	1,390	10,200	4,290	2,670	8,210	4,690	27	3,120	6,490	3,210	2,670	3,840	5,490
13	2,150	10,200	4,790	3,570	6,490	10,000	28	4,790	7,000	2,670	2,400	2,940	4,290
14	3,030	8,100	5,190	3,210	3,210	18,400	29	18,100	.....	2,580	1,770	1,770	4,890
15	2,580	6,090	5,690	2,240	1,720	28,900	30	13,400	.....	2,490	2,060	2,240	5,290
							31	11,000	.....	3,120	.....	2,400	.....

NOTE.—These discharges were obtained from a rating curve which is not well defined.

Monthly discharge of Wateree River near Camden, S. C., for 1910.

[Drainage area, 4,500 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	18,100	760	3,850	0.856	0.99	B
February	19,600	2,670	7,950	1.77	1.84	B
March	26,800	1,980	6,400	1.42	1.64	B
April	3,660	1,470	2,570	.571	.64	C
May	11,000	1,430	3,610	.802	.92	B
June	28,900	1,770	8,180	1.82	2.03	B

SAVANNAH RIVER BASIN.

DESCRIPTION.

Savannah River rises on the southern slope of the Blue Ridge, in the northeast corner of Georgia and the northwest corner of South Carolina, some of its headwaters coming across the State line from North Carolina. Its general course is southeast, and it forms the boundary between Georgia and South Carolina from the North Carolina line to the Atlantic Ocean. The basin is about 260 miles long and contains about 11,100 square miles.

The principal tributaries are Tallulah, Seneca, and Broad rivers. The name Tugaloo River is applied to the main stream above the mouth of the Seneca, and in turn it becomes Chattooga River above the mouth of the Tallulah.

A small area of the upper end of the basin lying in the Appalachian Mountains has an elevation of 3,000 feet and even more, but the fall is very rapid down to about 1,000 feet in the Piedmont Plateau region, in which most of the drainage basin lies. The Coastal Plain portion of this basin, from Augusta, Ga., down, is comparatively narrow.

Above the fall line, which passes a few miles above Augusta, Ga., the main streams and many smaller tributaries afford excellent water powers, having a good amount of fall and a large minimum flow.

Ice and snow have little or no effect on stream flow in this area. The average annual rainfall reaches 70 inches in the extreme upper portion and ranges from 50 to 60 inches in the other parts. The basin contains a number of fairly good sites for storage reservoirs on Tugaloo River and on the tributaries of the Seneca and on Broad River in Georgia.

The following special reports contain information regarding the hydrography of the Savannah River basin:

Water resources of Georgia, by B. M. and M. R. Hall: Water-Supply Paper U. S. Geol. Survey No. 197. This report contains data collected in this basin prior to 1906.

River surveys and profiles made during 1903, by W. C. Hall and J. C. Hoyt: Water-Supply Paper U. S. Geol. Survey No. 115. This report and separate sheets, showing the Catawba and Broad River profiles, may be obtained by applying to the Director, United States Geological Survey, Washington, D. C.

Relation of southern Appalachian Mountains to the development of inland water navigation and water power: U. S. Forest Service Circulars Nos. 143 and 144.

TUGALOO RIVER NEAR MADISON, S. C.

This station was originally established at Cooks Ferry July 19, 1898, and was discontinued December 31, 1901, when the ferry was moved. It was reestablished July 7, 1903, at Holcombs Ferry, 1 mile west of Madison, S. C., 900 feet below the Southern Railway bridge, about 1½ miles above the point where the old station

was located, and 2 miles below the mouth of Toccoa Creek. The data from this station have been used largely for water-power estimates.

The gage at Holcombs Ferry is a vertical staff in three sections. The low-water section, reading from 1 foot to 16 feet, is attached to a sycamore tree on the left bank about 30 feet above the ferry landing. The second section reads from 16 to 22 feet and is attached to another sycamore tree on the left bank about 18 feet above the ferry landing. The high-water section, reading from 21 to 31 feet, is fastened to a locust tree on the left bank at the fork of the road, about 175 feet from the ferry landing.

The gage heights are probably not seriously affected by artificial control, although there are some flash dams on headwater streams, used for booming logs, and when the water from one of these dams is released considerable rise occurs at the station for a few hours, often amounting to a foot or more.

The datum of both gages has remained constant during the period of their maintenance. There is, however, no established relation between the two gage zeros. The datum of the present gage is 630.10 feet above sea level.

Discharge measurements are made from a small boat held in place by a cable stretched across the river. Both banks are moderately high, but will overflow for about 200 feet on each side at extreme high stages. The bed of the river is sandy and changeable, necessitating frequent changes in the rating. The high-water part of the rating curve has not yet been developed.

The station was discontinued June 30, 1910.

Daily gage height, in feet, of Tugaloo River near Madison, S. C., for 1910.

[T. A. Spencer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	3.5	3.5	10.3	3.5	3.2	4.4	16	3.4	3.55	3.9	3.2	4.3	6.1
2	3.3	3.4	8.2	3.45	3.2	4.3	17	3.4	3.8	3.8	5.8	4.45	5.2
3	3.4	3.4	6.3	3.45	3.1	5.1	18	3.4	9.5	3.9	5.6	4.5	4.7
4	3.4	3.65	5.5	3.4	3.2	4.4	19	3.7	5.6	3.9	4.3	4.5	4.5
5	3.0	3.5	5.4	3.3	3.2	4.8	20	3.9	4.7	5.3	3.7	4.8	4.5
6	3.2	3.4	4.8	3.5	3.3	7.7	21	4.35	4.4	4.1	3.5	8.0	4.3
7	9.6	3.25	4.75	3.4	3.2	5.3	22	4.5	4.8	4.0	3.45	5.8	4.4
8	5.5	3.3	4.5	3.45	18.0	4.7	23	3.85	4.2	3.8	3.4	5.75	4.8
9	4.5	3.3	4.2	3.45	13.5	4.55	24	3.9	4.2	3.8	3.4	5.7	4.9
10	4.1	3.5	4.3	3.3	7.0	4.4	25	3.7	3.9	3.75	3.4	9.8	4.8
11	3.8	3.6	4.5	3.25	5.7	4.3	26	3.6	3.85	3.75	3.6	6.8	4.6
12	3.6	3.8	4.7	3.2	5.0	4.6	27	3.5	3.8	3.7	3.4	5.7	4.2
13	3.55	3.5	4.2	3.4	4.6	7.5	28	3.5	5.2	3.65	3.3	5.3	4.1
14	3.5	3.3	4.25	3.25	4.3	6.1	29	4.1	.....	3.6	3.4	4.9	4.0
15	3.5	3.4	4.0	3.2	4.25	6.6	30	3.7	.....	3.65	3.2	5.0	4.2
							31	3.6	.....	3.5	.....	47.	.....

Daily discharge, in second-feet, of Tugaloo River near Madison, S. C., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	1,250	1,250	7,640	1,250	1,060	1,920	16	1,180	1,280	1,540	1,060	1,840	3,460
2	1,120	1,180	5,540	1,220	1,060	1,840	17	1,180	1,460	1,460	3,170	1,960	2,600
3	1,180	1,180	3,650	1,220	996	2,510	18	1,180	6,840	1,540	2,980	2,000	2,170
4	1,180	1,360	2,880	1,180	1,060	1,920	19	1,390	2,980	1,540	1,840	2,000	2,060
5	940	1,250	2,790	1,120	1,060	2,250	20	1,540	2,170	2,700	1,390	2,250	2,000
6	1,060	1,180	2,250	1,250	1,120	5,040	21	1,880	1,920	1,690	1,250	5,340	1,840
7	6,940	1,090	2,210	1,180	1,060	2,700	22	2,000	2,250	1,610	1,220	3,170	1,920
8	2,880	1,120	2,000	1,220	15,300	2,170	23	1,500	1,760	1,460	1,180	3,120	2,250
9	2,000	1,120	1,760	1,220	10,800	2,040	24	1,540	1,760	1,460	1,180	3,070	2,340
10	1,690	1,250	1,840	1,120	4,340	1,920	25	1,390	1,540	1,430	1,180	7,140	2,250
11	1,460	1,320	2,000	1,090	3,070	1,840	26	1,320	1,500	1,430	1,320	4,140	2,080
12	1,320	1,460	2,170	1,060	2,420	2,080	27	1,250	1,460	1,390	1,180	3,070	1,760
13	1,280	1,250	1,760	1,180	2,080	4,840	28	1,250	2,600	1,360	1,120	2,700	1,690
14	1,250	1,120	1,800	1,090	1,840	3,460	29	1,690	.....	1,320	1,180	2,340	1,610
15	1,250	1,180	1,610	1,060	1,800	3,940	30	1,390	.....	1,360	1,060	2,420	1,760
							31	1,320	.....	1,250	.....	2,170	.....

NOTE.—These discharges were obtained from a rating curve which is fairly well defined between 690 and 1,600 second-feet.

Monthly discharge of Tugaloo River near Madison, S. C., for 1910.

[Drainage area, 593 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	6,940	940	1,610	2.72	3.14	B
February	6,840	1,090	1,710	2.88	3.00	B
March	7,640	1,250	2,140	3.61	4.16	B
April	3,170	1,060	1,330	2.24	2.50	B
May	15,300	996	3,150	5.31	6.12	C
June	5,040	1,610	2,410	4.06	4.53	B

NOTE.—As no measurements were made in 1910 the accuracy of these estimates is dependent on the permanency of conditions of flow.

SAVANNAH RIVER AT WOODLAWN, S. C.

This station is located at the Charleston & Western Carolina Railway bridge 1,000 feet from the depot at Woodlawn, S. C., 17 miles above Augusta, Ga., and 10 miles above the Augusta water-power dam. It is 5 miles above Stevens Creek, which is a large tributary from the Carolina side. The station was established November 9, 1905, and has been maintained continuously except from August 27 to October 12, 1908, when the gage was destroyed by a flood which washed out the two main spans of the east-channel bridge. The gage is read twice a day in order to equalize the slight fluctuations due to water-power operations.

The original standard chain gage was attached to the railroad bridge. The present temporary staff gage used since October 12, 1908, consists of three vertical sections attached to trees from 50 to 80 feet above the bridge. The datum of both gages is the same and has not changed since their installation.

Discharge measurements are made from the upstream side of the railway bridge.

Both banks overflow slightly at extreme high stages. An island which divides the channel into two sections is also overflowed at high stages, the overflow passing through about 900 feet of wooden trestle. The bed of the stream is composed mainly of rock and is rough, causing broken and irregular current in some portions of the cross section. Conditions of flow have changed somewhat since 1908, probably because a span of iron bridge lies crosswise in the main channel a short distance below the station, in what was originally the deepest and swiftest part. This obstruction probably did not affect the 1907–8 rating materially, as the trusswork was less obstructed than later on.

The monthly estimates for August to December, 1908, as published in Water-Supply Paper 242, are liable to some error and should be used with caution. Measurements in 1909 and in January, 1910, indicate that the obstruction altered the channel conditions and necessitated a new rating for 1909 and 1910. The natural conditions appear to be constant.

The station was discontinued June 30, 1910.

Discharge measurements of Savannah River at Woodlawn, S. C., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 21	E. H. Swett	589	3,100	4.94	6,440
22	do	596	3,580	5.77	8,620

Daily gage height, in feet, of Savannah River at Woodlawn, S. C., for 1910.

[J. C. Parks, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	3.9	7.2	15.8	4.8	4.5	5.0	16	4.5	5.5	6.5	4.5	5.0	8.9
2	4.15	6.7	11.2	4.8	4.4	4.9	17	4.7	5.4	6.5	5.4	4.9	7.2
3	4.2	6.3	7.6	4.75	4.4	5.7	18	4.5	9.9	6.4	8.4	4.8	6.0
4	4.35	5.25	6.6	4.75	4.35	5.4	19	4.4	11.8	6.1	8.2	4.7	5.8
5	4.4	5.0	6.4	4.7	4.4	5.2	20	4.5	8.9	6.0	7.2	4.6	5.65
6	6.6	4.9	6.5	4.6	4.4	6.6	21	4.95	9.4	5.9	6.4	5.2	5.3
7	5.95	5.0	6.5	4.6	4.55	5.9	22	5.6	8.9	7.0	5.1	7.3	5.65
8	5.3	4.95	6.6	4.6	5.1	5.5	23	6.2	8.0	5.35	4.8	6.4	5.7
9	4.8	5.0	6.6	4.5	12.6	5.2	24	5.8	6.9	5.2	4.65	6.5	5.55
10	4.6	5.0	6.5	4.45	13.3	5.9	25	6.1	6.2	5.1	4.55	8.4	5.25
11	4.5	6.4	7.0	4.5	8.0	6.4	26	5.75	5.85	5.0	4.5	7.8	5.05
12	4.5	6.2	7.0	4.5	6.4	6.7	27	6.3	5.7	5.0	4.5	7.0	4.8
13	4.5	7.3	6.6	4.5	5.7	7.8	28	6.6	12.9	5.1	4.5	6.1	4.6
14	4.5	5.95	6.7	4.55	5.3	9.7	29	11.1	.....	5.0	4.5	5.8	4.8
15	4.45	5.65	6.6	4.6	5.1	10.8	30	9.6	.....	4.9	4.5	5.5	5.5
							31	8.3	.....	4.85	.....	5.15	.....

Daily discharge, in second-feet, of Savannah River at Woodlawn, S. C., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	3,980	14,200	62,400	6,080	5,350	6,590	16	5,350	8,000	11,400	5,350	6,590	22,100
2	4,540	12,200	34,900	6,080	5,110	6,330	17	5,830	7,700	11,400	7,700	6,330	14,200
3	4,650	10,600	15,800	5,960	5,110	8,620	18	5,350	27,500	11,000	19,600	6,080	9,600
4	5,000	7,270	11,800	5,960	5,000	7,700	19	5,110	38,400	9,940	18,600	5,830	8,940
5	5,110	6,590	11,000	5,830	5,110	7,130	20	5,350	22,100	9,600	14,200	5,590	8,460
6	11,800	6,330	11,400	5,590	5,110	11,800	21	6,460	24,800	9,270	11,000	7,130	7,410
7	9,440	6,590	11,400	5,590	5,470	9,270	22	8,310	22,100	13,400	6,860	14,600	8,460
8	7,410	6,460	11,800	5,590	6,860	8,000	23	10,300	17,600	7,560	6,080	11,000	8,620
9	6,080	6,590	11,800	5,350	43,000	7,130	24	8,940	13,000	7,130	5,710	11,400	8,160
10	5,590	6,590	11,400	5,230	47,200	9,270	25	9,940	10,300	6,860	5,470	19,600	7,270
11	5,350	11,000	13,400	5,350	17,600	11,000	26	8,780	9,100	6,590	5,350	16,700	6,720
12	5,350	10,300	13,400	5,350	11,000	12,200	27	10,600	8,620	6,590	5,350	13,400	6,080
13	5,350	14,600	11,800	5,350	8,620	16,700	28	11,800	44,800	6,860	5,350	9,940	5,590
14	5,350	9,440	12,200	5,470	7,410	26,400	29	34,300	.....	6,590	5,350	8,940	6,080
15	5,230	8,460	11,800	5,590	6,860	32,600	30	25,900	.....	6,330	5,350	8,000	8,000
							31	19,100	.....	6,200	.....	7,000	.....

NOTE.—These discharges are based on a rating curve that is fairly well defined between 5,400 and 20,000 second-feet.

Monthly discharge of Savannah River at Woodlawn, S. C., for 1910.

[Drainage area, 6,600 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	34,300	3,980	8,760	1.33	1.53	B
February	44,800	6,330	14,000	2.12	2.21	A
March	62,400	6,200	12,700	1.92	2.21	A
April	19,600	5,230	7,060	1.07	1.19	A
May	47,200	5,000	11,100	1.68	1.94	A
June	32,600	5,590	10,500	1.59	1.77	A

TALLULAH RIVER AT TALLULAH FALLS, GA.

This station is located at the wagon bridge at Tallulah Falls, about one-fourth mile above the beginning of the falls proper. It was established August 29, 1900, but the record for that year extended only to October 19. Readings were resumed January 18, 1901, and were again discontinued December 31, 1901. On July 15, 1904, the station was reestablished and observations have been continued without break except from July 1 to August 15, 1909. On August 16, 1909, the station was reestablished by special request of the North Georgia Electric Co.

The original staff gage, established in 1900, about 50 feet above the bridge, is still in place, and other gages which have superseded it have been set to agree with the original datum. The present gage is of the standard chain type and is located on the bridge, from which discharge measurements are made. Both banks are high and not subject to overflow. The bed of the stream is rough and composed of rocks. The flow is not perceptibly affected by artificial control of water. Conditions of flow have changed slightly since the establishment of the station.

The following measurement was made by M. R. Hall:

June 24: Width, 63 feet; area of section, 405 square feet; gage height, 2.70 feet; discharge, 904 second-feet.

Daily gage height, in feet, of Tallulah River at Tallulah Falls, Ga., 1910.

[Wyly Pitts, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.4	1.5	3.8	1.5	1.4	2.05	.....	1.6	2.25	1.3	1.0	1.0
2	1.5	1.5	3.0	1.5	1.4	2.0	.....	1.5	1.8	1.35	1.0	.9
3	1.5	1.55	2.55	1.5	1.4	2.35	.....	1.6	1.55	1.1	1.0	.9
4	1.4	1.65	2.35	1.5	1.4	2.0	.....	1.7	1.6	1.1	1.0	.9
5	1.4	1.55	2.2	1.45	1.4	2.65	.....	1.6	1.55	1.1	1.0	2.3
6	1.7	1.5	2.1	1.6	1.4	3.2	.....	1.7	1.45	1.15	1.0	3.4
7	3.2	1.4	1.95	1.4	2.0	2.6	.....	1.7	1.4	1.65	1.0	1.85
8	2.25	1.4	1.95	1.4	4.6	2.25	.....	1.6	1.4	2.2	1.0	1.55
9	1.95	1.55	1.9	1.4	3.6	2.2	.....	1.55	1.4	2.15	1.0	1.4
10	1.8	1.45	2.05	1.4	2.65	2.15	.....	1.55	1.6	1.7	1.0	1.3
11	1.7	1.55	2.1	1.4	2.4	2.1	.....	1.4	1.35	1.45	1.0	1.25
12	1.6	1.65	2.0	1.4	2.2	2.3	.....	1.5	1.35	1.4	.9	1.2
13	1.6	1.35	1.9	1.5	2.2	2.7	.....	1.5	1.3	1.3	1.0	1.1
14	1.6	1.35	1.8	1.4	2.0	2.4	.....	1.6	1.25	1.3	1.0	1.1
15	1.5	1.5	1.75	1.4	1.9	2.9	.....	1.6	1.3	1.2	1.0	1.1
16	1.5	1.7	1.75	1.5	1.9	2.6	.....	1.45	1.1	1.2	1.0	1.1
17	1.5	1.9	1.7	3.0	2.1	2.3	.....	1.4	1.1	1.2	1.0	1.1
18	1.5	3.0	1.7	2.2	2.2	2.2	.....	1.5	1.1	1.1	1.0	1.15
19	1.65	2.3	1.7	1.9	2.0	2.15	.....	1.4	1.1	1.1	1.0	1.2
20	1.55	2.05	2.2	1.8	2.55	2.05	1.95	1.4	1.1	1.1	1.0	1.1
21	2.25	2.05	1.9	1.7	3.2	2.0	1.9	1.3	1.1	1.05	1.0	1.0
22	1.9	2.0	1.8	1.6	2.7	2.3	1.85	1.3	1.1	1.0	1.0	1.0
23	1.7	1.9	1.75	1.6	2.7	2.3	1.75	1.3	2.4	1.0	.9	1.3
24	1.65	1.8	1.7	1.55	3.3	2.5	1.8	1.3	1.95	1.0	.9	2.1
25	1.6	1.7	1.6	1.55	3.8	2.0	1.7	1.35	1.5	1.0	1.0	1.5
26	1.6	1.7	1.65	1.65	2.85	2.0	1.7	1.45	1.4	1.0	.95	1.35
27	1.6	1.95	1.6	1.6	2.55	1.9	1.95	1.4	1.25	1.0	.95	1.3
28	1.65	2.75	1.6	1.5	2.4	1.8	1.8	1.3	1.2	1.15	1.0	1.3
29	1.65	.....	1.6	1.5	2.3	1.85	1.7	1.3	1.6	1.1	1.0	1.3
30	1.6	.....	1.55	1.5	2.25	2.0	1.7	1.4	1.5	1.0	1.0	1.8
31	1.6	.....	1.5	.....	2.15	.....	1.6	2.75	.....	1.0	.....	1.55

Daily discharge, in second-feet, of Tallulah River at Tallulah Falls, Ga., 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	365	400	1,960	400	365	632	.....	440	725	330	237	237
2	400	400	1,170	400	365	610	.....	400	520	348	237	212
3	400	420	880	400	365	775	.....	440	420	265	237	212
4	365	460	775	400	365	610	.....	480	440	265	237	212
5	365	420	700	382	365	930	.....	440	420	265	237	750
6	480	400	655	440	365	1,330	.....	480	382	280	237	1,520
7	1,330	365	588	365	610	910	.....	480	365	460	237	542
8	725	365	588	365	2,970	725	.....	440	365	700	237	420
9	588	420	565	365	1,730	700	.....	420	365	672	237	365
10	520	382	632	365	940	678	.....	420	440	480	237	330
11	480	420	655	365	800	655	.....	365	348	382	237	312
12	440	460	610	365	700	750	.....	400	348	365	212	295
13	440	348	565	400	700	970	.....	400	330	330	237	265
14	440	348	520	365	610	800	.....	440	312	330	237	265
15	400	400	500	365	565	1,100	.....	440	330	295	237	265
16	400	480	500	400	565	910	.....	382	265	295	237	265
17	400	565	480	1,170	655	750	.....	365	265	295	237	265
18	400	1,170	480	700	700	700	.....	400	265	265	237	280
19	460	750	480	565	700	678	.....	365	265	265	237	295
20	420	632	700	520	880	632	588	365	265	265	237	265
21	725	632	565	480	1,330	610	565	330	265	251	237	237
22	565	610	520	440	970	750	542	330	265	237	237	237
23	480	565	500	440	970	750	500	330	800	237	212	330
24	460	520	480	420	1,420	850	520	330	588	237	212	655
25	440	480	440	420	1,960	610	480	348	400	237	237	400
26	440	480	460	460	1,060	610	480	382	365	237	224	348
27	440	588	440	440	880	565	588	365	312	237	224	330
28	460	1,000	440	400	800	520	520	330	295	280	237	330
29	460	.....	440	400	750	542	480	330	440	265	237	330
30	440	.....	420	400	725	610	480	365	400	237	237	520
31	440	.....	400	.....	678	.....	440	1,000	.....	237	.....	420

NOTE.—These discharges were obtained from a fairly well defined rating curve.

Monthly discharge of Tallulah River at Tallulah Falls, Ga., for 1910.

[Drainage area, 191 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,330	365	489	2.56	2.95	A
February	1,170	348	517	2.71	2.82	A
March	1,960	400	616	3.23	3.72	A
April	1,170	365	447	2.34	2.61	A
May	2,970	365	866	4.53	5.22	A
June	1,330	520	742	3.88	4.33	A
July	.....	.....	a 682	3.57	4.12	C
August	1,000	336	413	2.16	2.49	A
September	725	265	386	2.02	2.25	B
October	700	237	318	1.66	1.91	B
November	237	212	234	1.23	1.37	B
December	1,520	212	378	1.98	2.28	B
The year	2,970	212	508	2.66	36.07	

a July 1–19 estimated to average 787 second-feet by comparison with Broad River near Carlton, Ga.

BROAD RIVER (OF GEORGIA) NEAR CARLTON, GA.

This station, which is located at the Seaboard Air Line Railway bridge 3 miles east of Carlton, Ga., and 2 miles above the mouth of the south fork, was established May 27, 1897. Gage readings are taken by the United States Weather Bureau and are furnished to the United States Geological Survey.

Records of this station are valuable for water-power studies, both on Broad River and on Savannah River, to which it is tributary. The flow is affected little or not at all by artificial control. Measurements are made from the upstream side of the bridge.

The datum of the chain gage, which is on the bridge, has remained constant since the establishment of the station; its elevation is 384 feet above sea level. The left bank overflows for about 400 feet at a gage height of about 16 feet. The bed of the stream is sand and gravel and is slightly changeable.

Discharge measurements of Broad River (of Georgia) near Carlton, Ga., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 9	E. H. Swett	182	445	2.93	795
May 16	M. R. Hall	171	386	2.54	759

Daily gage height, in feet, of Broad River (of Georgia) near Carlton, Ga., for 1910.

[M. C. Power, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	3.5	7.5	2.4	2.3	2.0	3.9	2.7	14.5	2.1	2.2	2.2
2	2.8	3.1	6.9	2.1	2.1	2.2	5.3	2.2	9.5	2.1	2.0	2.1
3	2.5	2.8	5.2	2.3	2.2	2.4	3.9	2.5	5.2	2.2	2.1	2.0
4	2.4	3.1	4.1	2.7	2.0	3.0	3.6	2.6	4.0	2.0	2.2	2.2
5	2.2	2.3	3.1	2.4	2.2	2.2	4.0	2.2	3.3	2.2	2.0	2.5
6	2.5	2.1	3.0	2.0	2.3	2.5	4.6	2.6	3.6	2.2	2.3	4.8
7	3.0	2.3	3.3	2.3	2.1	3.4	4.5	3.1	3.1	2.5	2.2	4.0
8	3.4	2.2	3.1	2.4	2.6	4.0	4.9	2.7	2.4	3.4	2.0	3.5
9	2.7	2.8	2.8	2.6	4.3	3.2	5.5	3.9	2.6	3.0	2.1	3.3
10	2.6	2.6	2.6	2.3	4.1	2.8	4.0	3.1	2.2	2.7	2.2	2.5
11	2.6	3.3	2.4	2.3	3.7	3.5	3.5	2.6	2.2	2.3	2.1	2.3
12	2.2	3.1	2.9	2.1	3.5	4.3	2.4	2.2	2.3	2.0	2.2	2.0
13	2.1	2.8	2.3	2.0	3.2	3.9	2.8	2.7	2.1	2.2	2.1	2.2
14	2.5	2.6	2.5	2.1	3.0	4.6	2.4	2.5	2.3	2.4	2.2	2.4
15	2.5	2.4	2.3	2.3	2.8	7.1	4.9	2.2	2.2	2.1	2.0	2.2
16	2.4	2.6	2.5	2.0	2.6	4.5	3.8	2.0	2.0	2.3	2.2	2.1
17	2.4	2.5	2.9	2.3	2.7	3.0	2.3	2.3	2.2	2.1	2.1	2.0
18	2.4	6.3	2.7	4.0	2.5	2.8	3.3	2.0	2.1	2.0	2.3	2.7
19	2.4	6.1	2.5	3.8	2.4	2.3	3.7	2.2	2.2	2.2	2.2	2.3
20	2.4	4.1	2.4	2.6	3.8	2.8	3.1	2.5	2.1	2.1	2.0	2.8
21	2.7	3.9	2.6	2.3	4.5	2.7	2.7	2.6	2.2	2.2	2.2	2.4
22	3.5	4.2	2.4	2.2	3.5	3.1	2.2	2.3	2.0	2.0	2.1	2.2
23	2.6	3.6	2.4	2.3	3.1	2.2	2.8	2.2	2.6	2.2	2.0	2.4
24	3.0	3.5	2.5	2.0	2.8	2.8	3.0	2.4	3.1	2.0	2.2	2.7
25	3.2	3.6	2.7	2.3	3.7	3.2	2.5	2.7	2.6	2.1	2.1	3.0
26	3.2	3.4	2.3	2.0	4.7	2.7	2.3	2.5	2.2	2.2	2.0	2.6
27	3.1	2.9	2.1	2.2	3.7	2.3	2.7	2.2	2.0	2.0	2.2	2.2
28	3.9	2.6	2.7	2.4	3.3	2.0	2.3	2.3	2.3	2.1	2.3	2.1
29	5.1	.....	2.4	2.1	3.0	2.3	2.6	2.1	2.5	2.3	2.5	2.0
30	4.0	.....	2.0	2.3	2.7	4.5	2.2	2.3	2.3	2.2	2.3	2.3
31	3.7	.....	2.3	.....	2.3	.....	2.0	13.0	.....	2.0	.....	2.7

Daily discharge, in second-feet, of Broad River (of Georgia) near Carlton, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	750	1,450	6,060	695	645	500	1,790	865	17,200	545	595	595
2	930	1,140	5,220	545	545	595	3,210	595	8,990	545	500	545
3	750	930	3,100	645	595	695	1,790	750	3,100	595	545	500
4	695	1,140	1,970	865	500	1,070	1,540	805	1,880	500	595	595
5	595	645	1,140	695	595	595	1,880	595	1,290	595	500	750
6	750	545	1,070	500	645	750	2,450	805	1,540	595	645	2,660
7	1,070	645	1,290	645	545	1,370	2,350	1,140	1,140	750	595	1,880
8	1,370	595	1,140	695	805	1,880	2,770	865	695	1,370	500	1,450
9	865	930	930	805	2,160	1,220	3,440	1,790	805	1,070	545	1,290
10	805	805	805	645	1,970	930	1,880	1,140	595	865	595	750
11	805	1,290	695	645	1,620	1,450	1,450	805	595	645	545	645
12	595	1,140	1,000	545	1,450	2,160	695	595	645	500	595	500
13	545	930	645	500	1,220	1,790	930	865	545	595	545	595
14	750	805	750	545	1,070	2,450	695	750	645	695	595	695
15	750	695	645	645	930	5,500	2,770	595	595	545	500	595
16	695	805	750	500	805	2,350	1,700	500	500	645	595	545
17	695	750	1,000	645	865	1,070	645	645	595	545	545	500
18	695	4,430	865	1,880	750	930	1,290	500	545	500	645	865
19	695	4,180	750	1,700	695	645	1,620	595	595	595	595	645
20	695	1,970	695	805	1,700	930	1,140	750	545	545	500	930
21	865	1,790	805	645	2,350	865	865	805	595	595	595	695
22	1,450	2,060	695	595	1,450	1,140	595	645	500	500	545	595
23	805	1,540	695	645	1,140	595	930	595	805	595	500	695
24	1,070	1,450	750	500	930	930	1,070	695	1,140	500	595	865
25	1,220	1,540	865	645	865	1,220	750	865	805	545	545	1,070
26	1,220	1,370	645	500	2,560	865	645	750	595	595	500	803
27	1,140	1,000	545	595	1,620	645	865	595	500	500	595	595
28	1,790	805	865	695	1,290	500	645	645	645	545	645	545
29	2,990	.....	695	545	1,070	645	805	545	750	645	750	500
30	1,880	.....	500	645	865	2,350	595	645	645	595	645	645
31	1,620	.....	645	.....	645	.....	500	14,700	.....	500	.....	865

NOTE.—These discharges were obtained from a rating curve which is well defined below 9,800 second-feet.

Monthly discharge of Broad River (of Georgia) near Carlton, Ga., for 1910.

[Drainage area, 762 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	2,990	545	1,020	1.34	1.54
February	4,430	545	1,330	1.75	1.82
March	6,060	500	1,230	1.61	1.86
April	1,880	500	705	.925	1.03
May	2,560	500	1,130	1.48	1.71
June	5,500	500	1,290	1.69	1.89
July	3,440	500	1,430	1.88	2.17
August	14,700	500	1,210	1.59	1.83
September	17,200	500	1,670	2.19	2.44
October	1,370	500	624	.819	.94
November	750	500	573	.752	.84
December	2,660	500	820	1.08	1.24
The year	17,200	500	1,080	1.42	19.31

NOTE.—The uniformity of the minima and also the high values of certain of the maxima render the accuracy of the records at this station somewhat questionable. The values in the above tables should be used with caution.

ALTAMAHA RIVER BASIN.

DESCRIPTION.

Altamaha River rises in the north-central part of Georgia, along the southern slope of the Chattahoochee Ridge, flows southeastward, and discharges into the Atlantic Ocean near Darien. The basin is about 250 miles long and has an area of 14,100 square miles.

The two main tributaries forming the Altamaha are Oconee and Ocmulgee rivers, which unite about 100 miles above Darien. Oconee River rises in Hall County and flows in a southeasterly direction to the Altamaha. Apalachee River enters the Oconee near the southeast corner of Morgan County. Little River enters the main stream about 15 miles above Milledgeville, Ga. Ocmulgee River, the westernmost of the main tributaries, is formed by streams that rise in Fulton, Dekalb, and Gwinnett counties; Yellow, South, and Alcovy rivers are its upper tributaries. Towaliga River enters the Ocmulgee at about the southwest corner of Jasper County, which is above Macon. Ohoopee River is a tributary of the Altamaha about 30 miles below the junction of Oconee and Ocmulgee rivers.

The portion above the fall line, which passes near Milledgeville and Macon, lies entirely in the Piedmont Plateau and contains great masses of granite, including Stone Mountain in Dekalb County, 16 miles east of Atlanta, which rises about 700 feet above the surrounding country and covers several square miles. The larger part of the basin lies in the Coastal Plain region. Very little of this basin is too steep for agriculture, and only a rather small amount of original forest remains. Probably the larger part of the lands now

wooded consists of lands once cultivated but now carrying second-growth timber in the Piedmont region and cut-over timber lands in the southern portion.

The mean annual rainfall of the basin is about 50 inches. The basin contains many good reservoir sites for partial storage in connection with power plants, and larger sites are no doubt available, especially on Oconee River. Above the fall line all the streams have considerable slope and afford many excellent sites for water-power development.

The following special reports contain information regarding the hydrography of the Altamaha River basin:

Water resources of Georgia, by B. M. and M. R. Hall: Water-Supply Paper U. S. Geol. Survey No. 197. This report contains data on stream flow, water power, and river surveys collected prior to 1906.

River surveys and profiles made during 1903, by W. C. Hall and J. C. Hoyt: Water-Supply Paper U. S. Geol. Survey No. 115. This report may be obtained by applying to the Director United States Geological Survey, Washington, D. C.

Relation of southern Appalachian Mountains to the development of inland water navigation: U. S. Forest Service Circular No. 143.

OCMULGEE RIVER NEAR JACKSON, GA.

This station, which is located at Pittmans Ferry, 8 miles southeast of Jackson and 6 miles above the old Flovilla station at Lamars Ferry, was established May 18, 1906, to take the place of the Lamars Ferry station, for which records of discharge had been obtained from July 26, 1901, to September 27, 1902; from July 1 to December 31, 1903; and from August 1, 1904, to December 31, 1905.

Yellow Water Creek comes in one-half mile below the station, and Tussahaw Creek enters 3 miles above. The station is three-fourths mile below the large dam and power plant of the Central Georgia Power Co., which was completed late in 1910. Water powers above cause moderate fluctuations of gage heights, but the mean of two readings a day is thought to be sufficiently accurate up to the time the new power plant was put in operation. Some of the 1910 records were affected by the filling of the new reservoir.

The datum of the vertical staff gage, the lowest section of which is located 15 feet above the ferry cable, has remained constant since the establishment of the station.

Both banks overflow at high stages for about 200 feet. The current is rather sluggish at low stages, and as all measurements are made from a boat it is not practicable to make flood measurements.

Conditions of discharge are constant, as a permanent rock shoal about 400 feet below the station controls the height of water at the gage. The channel at the section is deep and subject to some filling in of the bottom.

Discharge measurements of Ocmulgee River near Jackson, Ga., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 18	F. P. Thomas	282	1,200	4.22	606
19	do	282	1,230	4.22	589
Nov. 20	G. F. Harley			2.80	*a* 20
b 21	do			3.81	256
Dec. 9	do		1,480	4.85	1,400

a Estimated. *b* Made below mouth of Yellow Water Creek. Flow of the creek deducted.

Daily gage height, in feet, of Ocmulgee River near Jackson, Ga., for 1910.

[C. A. Pittman, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.6	5.2	10.6	4.7	4.6	4.4	6.7	4.4	5.0	4.3	4.2	4.3
2	4.6	5.0	9.3	4.7	4.6	4.4	6.65	4.4	4.9	4.2	4.2	4.3
3	4.6	5.0	6.95	4.65	4.55	4.4	7.0	4.3	4.95	4.2	4.1	4.3
4	4.5	5.1	6.2	4.65	4.5	4.35	6.5	4.3	5.75	4.2	4.15	4.2
5	4.5	5.0	5.75	4.6	4.5	4.4	6.35	4.55	5.2	4.2	4.2	4.3
6	4.5	4.8	5.45	4.65	4.5	4.8	5.85	4.9	4.75	4.2	4.2	4.7
7	4.8	4.8	5.3	4.6	4.5	4.75	5.8	4.9	4.45	4.25	4.2	4.65
8	5.05	4.75	5.2	4.5	4.6	4.55	6.35	4.85	4.3	4.95	4.2	3.42
9	4.85	4.75	5.1	4.6	4.75	4.45	6.4	4.6	4.3	5.15	4.3	4.85
10	4.7	4.75	5.0	4.5	4.8	4.7	6.2	4.5	4.55	4.9	4.25	4.85
11	4.65	4.9	5.2	4.55	4.65	4.85	5.7	4.4	4.45	4.65	4.25	4.8
12	4.6	5.15	5.8	4.55	4.6	5.9	5.4	4.4	4.3	4.5	4.25	4.0
13	4.6	5.1	5.55	5.0	5.25	5.5	5.1	4.35	4.3	4.4	4.2	4.55
14	4.55	5.05	5.25	4.9	4.75	5.3	5.0	4.3	4.25	4.3	4.25	4.85
15	4.55	4.85	5.15	4.7	4.6	6.3	5.2	4.3	4.2	4.25	4.2	4.1
16	4.5	4.8	5.05	4.8	4.5	5.1	5.5	4.3	4.15	4.2	4.1	4.2
17	4.5	5.0	4.95	8.0	4.6	4.85	5.6	4.25	4.15	4.2	4.0	3.85
18	4.5	7.1	4.9	9.2	4.7	4.65	5.1	4.2	4.1	4.2	3.95	4.1
19	4.5	6.65	4.9	6.2	4.7	4.6	4.75	4.3	4.1	4.2	3.6	4.25
20	4.6	5.75	4.85	5.4	4.85	4.5	4.65	4.7	4.2	4.1	2.78	4.1
21	4.9	5.8	4.85	5.2	5.1	4.5	4.6	4.3	4.3	4.15	3.8	4.25
22	5.3	6.0	4.85	5.0	5.05	5.75	4.6	4.3	4.2	4.2	3.8	4.3
23	5.0	5.7	4.8	4.9	5.1	4.85	4.5	4.2	4.2	4.05	3.85	4.3
24	5.0	8.9	4.8	4.8	5.85	4.65	5.05	4.2	4.1	4.15	4.25	4.3
25	5.2	6.9	4.8	4.8	6.1	4.6	4.9	4.5	4.05	4.15	4.1	4.3
26	5.0	6.0	4.8	4.8	5.8	4.55	4.8	4.3	4.1	4.15	3.92	4.3
27	4.9	5.55	4.75	4.8	5.2	4.4	4.55	4.2	4.1	4.15	4.4	4.3
28	5.9	10.8	4.7	4.8	4.8	4.4	4.5	4.2	4.0	4.2	4.3	4.3
29	6.3	.....	4.7	4.7	4.7	4.4	4.5	4.15	4.6	4.15	4.2	4.3
30	5.7	.....	4.7	4.7	4.55	6.3	4.5	4.2	4.4	4.1	4.3	4.3
31	5.4	.....	4.7	.....	4.5	.....	4.45	4.55	.....	4.2	.....	4.35

NOTE.—Gage heights Nov. 19–23 affected by the closing of the dam above the station. On Nov. 20, flow through the dam was entirely stopped.

Daily discharge, in second-feet, of Ocmulgee River near Jackson, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,080	2,230	13,300	1,240	1,080	790	5,300	790	1,820	670	565	670
2	1,080	1,820	10,600	1,240	1,080	790	5,200	790	1,620	565	565	670
3	1,080	1,820	5,820	1,100	1,000	790	5,920	670	1,720	565	470	670
4	925	2,020	4,280	1,100	925	730	4,900	670	3,360	565	518	565
5	925	1,820	3,360	1,080	925	790	4,590	1,000	2,230	565	565	670
6	925	1,420	2,740	1,160	925	1,420	3,560	1,620	1,330	565	565	1,240
7	1,420	1,420	2,440	1,080	925	1,330	3,460	1,620	858	618	565	1,160
8	1,920	1,330	2,230	925	1,080	1,000	4,590	1,520	670	1,720	565	120
9	1,520	1,330	2,020	1,080	1,330	858	4,690	1,080	670	2,130	670	1,520
10	1,240	1,330	1,820	925	1,420	1,240	4,280	925	1,000	1,620	618	1,520
11	1,160	1,620	2,230	1,000	1,160	1,520	3,260	790	858	1,160	618	1,420
12	1,080	2,130	3,460	1,000	1,080	3,660	2,640	790	670	925	618	390
13	1,080	2,020	2,950	1,820	2,330	2,840	2,020	730	670	790	565	1,000
14	1,000	1,920	2,330	1,620	1,330	2,440	1,820	670	618	670	618	1,520
15	1,000	1,520	2,130	1,240	1,080	4,480	2,230	670	565	618	565	470
16	925	1,420	1,920	1,420	925	2,020	2,840	670	518	565	470	565
17	925	1,820	1,720	7,970	1,080	1,520	3,050	618	518	565	390	290
18	925	6,120	1,620	10,400	1,240	1,160	2,020	565	470	565	355	470
19	925	5,200	1,620	4,280	1,240	1,080	1,330	670	470	565	170	618
20	1,080	3,360	1,520	2,640	1,520	925	1,160	1,240	565	470	18	470
21	1,620	3,460	1,520	2,230	2,020	925	1,080	670	670	518	260	618
22	2,440	3,870	1,520	1,820	1,920	3,360	1,080	670	565	565	260	670
23	1,820	3,260	1,420	1,620	2,020	1,520	925	565	565	430	290	670
24	1,820	9,820	1,420	1,420	3,560	1,160	1,920	565	470	518	618	670
25	2,230	5,720	1,420	1,420	4,080	1,080	1,620	925	430	518	470	670
26	1,820	3,870	1,420	1,420	3,460	1,000	1,420	670	470	518	334	670
27	1,620	2,950	1,330	1,420	2,230	790	1,000	565	470	518	790	670
28	3,660	13,700	1,240	1,420	1,420	790	925	565	390	565	670	670
29	4,480	.....	1,240	1,240	1,240	790	925	518	1,080	518	565	670
30	3,260	.....	1,240	1,240	1,000	4,480	925	565	790	470	690	670
31	2,640	.....	1,240	.....	925	.....	858	1,000	.....	565	.....	730

NOTE.—These discharges were obtained from a rating curve which is fairly well defined.

Monthly discharge of Ocmulgee River near Jackson, Ga., for 1910.

[Drainage area, 1,400 square miles].

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	4,480	925	1,600	1.14	1.31	A
February	13,700	1,330	3,230	2.31	2.40	A
March	13,300	1,240	2,750	1.96	2.26	A
April	10,400	925	1,990	1.42	1.58	A
May	4,080	925	1,530	1.09	1.26	A
June	4,480	730	1,580	1.13	1.26	A
July	5,920	858	2,630	1.88	2.17	A
August	1,620	518	819	.585	.67	A
September	3,360	390	903	.645	.72	A
October	2,130	430	715	.511	.59	A
November	790	18	500	.357	.40	B
December	1,520	120	755	.539	.62	A
The year	13,700	18	1,570	1.12	15.24	

OCMULGEE RIVER AT MACON, GA.

This station is located at the Fifth Street Bridge in the city of Macon, near the Southern Railway passenger depot and about 500 feet above the Central of Georgia Railway bridge. The United States Weather Bureau established a gage at Macon on January 21, 1893, and October 18, 1895, discharge measurements were begun by the United States Geological Survey. Gage heights are furnished by the United States Weather Bureau.

Above Macon Ocmulgee River and most of its tributaries afford abundant water power. Some fluctuation in gage heights at low stages is probably caused by control of flow at mills above. Very great fluctuations will be caused by the operation of the large dam near Jackson, which was completed late in 1910. As at other stations situated just below the fall line, rapidly rising or falling stages are likely to be attended by variations in surface slope, causing greater or less discharge than for the normal rating.

The United States Weather Bureau gage originally used at this station is a heavy timber bolted to a pier of the Central of Georgia Railway bridge. On October 9, 1905, a standard chain gage was installed on the Fifth Street Bridge, where discharge measurements are made. These gages have been referred to the same datum and have given practically the same readings, varying slightly owing to surface slope between locations.

Both banks are high and neither is subject to overflow. The bed of the river is soft and shifting, and a great amount of change in the station rating curve has occurred as the result of changes in the river bed at and below the station.

Discharge measurements of Ocmulgee River at Macon, Ga., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 27	M. R. Hall	249	1,300	4.09	1,990
27	do	249	1,340	4.13	2,060
Nov 9	do	230	747	1.76	921
9	do	230	750	1.82	940

Daily gage height, in feet, of Ocmulgee River at Macon, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.8	6.4	19.1	3.8	3.4	2.5	12.5	2.4	3.2	2.1	1.4	1.4
2	3.0	5.3	18.3	3.6	3.2	2.4	11.8	2.3	4.2	1.8	1.4	1.8
3	3.0	5.0	14.4	3.5	3.1	2.3	12.7	2.2	3.8	1.5	1.5	1.7
4	3.0	5.4	11.0	3.5	3.0	2.2	13.3	2.1	4.3	1.4	1.6	1.8
5	2.8	5.4	9.2	3.6	2.9	2.2	10.3	6.2	6.3	1.5	1.5	1.6
6	2.8	4.8	7.8	3.5	2.9	2.4	7.9	3.0	4.6	1.5	1.6	3.2
7	3.1	4.0	6.8	3.5	2.8	3.7	9.0	3.0	3.2	1.7	1.5	3.5
8	4.0	4.0	6.3	3.3	2.8	3.5	10.1	4.1	2.3	6.7	1.5	2.7
9	4.7	3.8	6.0	3.2	3.4	2.8	9.9	3.8	1.9	5.8	1.8	2.4
10	3.7	3.6	5.7	3.0	3.6	2.4	9.9	3.0	1.9	4.8	1.6	2.2
11	3.2	3.9	5.4	3.0	3.7	2.9	8.9	2.7	3.1	4.1	1.6	3.4
12	3.1	6.4	6.0	2.9	3.2	4.7	10.2	2.2	2.5	3.1	1.6	3.1
13	3.0	6.0	7.5	3.1	3.1	8.4	6.9	2.2	2.1	2.5	1.4	1.8
14	3.0	5.2	6.5	4.3	5.0	6.6	5.3	2.2	1.9	2.1	1.4	1.7
15	2.9	4.8	5.9	4.5	3.5	6.1	4.6	2.1	1.8	1.8	1.3	1.6
16	2.8	4.4	5.4	4.1	2.8	9.1	5.2	2.2	1.6	1.8	1.3	2.4
17	2.8	4.1	5.1	11.2	2.7	5.6	7.0	2.0	1.5	1.6	1.5	1.4
18	2.8	10.6	4.7	16.0	3.1	4.3	12.3	1.8	1.5	1.5	1.0	1.5
19	2.8	12.2	4.6	14.0	3.4	3.4	7.6	1.7	1.3	1.5	1.3	1.7
20	2.8	10.6	4.5	9.0	3.3	3.0	5.9	2.0	1.1	1.6	1.0	1.8
21	3.4	7.8	4.4	6.8	3.4	2.8	4.0	3.2	1.4	1.5	.8	1.6
22	4.4	10.4	5.0	5.8	4.6	2.5	3.5	2.0	1.9	1.5	.2	1.5
23	5.0	9.7	4.4	5.2	4.7	5.8	3.1	1.7	1.5	1.4	.8	1.5
24	4.6	9.4	4.4	4.8	5.1	4.0	2.9	1.7	1.3	1.3	.8	1.9
25	4.7	16.3	4.3	4.3	4.9	3.1	4.6	1.6	1.3	1.3	2.0	2.0
26	4.8	12.0	4.2	4.0	7.6	3.0	4.4	2.6	1.1	1.5	1.4	1.9
27	4.5	9.1	4.0	4.0	6.6	3.0	3.9	1.9	1.1	1.4	1.3	1.8
28	5.2	7.3	4.0	4.1	4.3	2.4	3.1	1.8	1.2	1.4	1.7	1.8
29	13.9	.....	4.1	3.9	3.4	2.2	2.8	1.6	1.4	1.4	2.4	1.8
30	10.3	.....	4.0	3.8	3.1	3.2	2.8	1.4	2.4	1.4	1.6	2.2
31	7.7	.....	4.0	.....	2.7	.....	2.5	4.6	.....	1.4	.....	2.3

NOTE.—Low gage heights Nov. 20–24 caused by stopping water at the new dam near Jackson.

Daily discharge, in second-feet, of Ocmulgee River at Macon, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,370	3,410	36,300	1,850	1,650	1,240	9,610	1,190	1,550	1,070	784	784
2	1,460	2,700	32,200	1,750	1,550	1,190	8,500	1,150	2,060	942	784	942
3	1,460	2,520	14,600	1,700	1,510	1,150	9,980	1,110	1,850	822	822	902
4	1,460	2,760	7,410	1,700	1,460	1,110	11,300	1,070	2,120	784	862	942
5	1,370	2,760	5,490	1,750	1,420	1,110	6,590	3,280	3,340	822	822	862
6	1,370	2,400	4,380	1,700	1,420	1,190	4,460	1,460	2,280	822	862	1,550
7	1,510	1,950	3,680	1,700	1,370	1,800	5,310	1,460	1,550	902	822	1,700
8	1,950	1,950	3,340	1,600	1,370	1,700	6,370	2,000	1,150	3,610	822	1,330
9	2,340	1,850	3,150	1,550	1,650	1,370	6,160	1,850	982	3,020	942	1,190
10	1,800	1,750	2,960	1,460	1,750	1,190	6,160	1,460	982	2,400	862	1,110
11	1,550	1,900	2,760	1,460	1,800	1,420	5,230	1,330	1,510	2,000	862	1,650
12	1,510	3,410	3,150	1,420	1,550	2,340	6,480	1,110	1,240	1,510	862	1,510
13	1,460	3,150	4,170	1,510	1,510	4,830	3,750	1,110	1,070	1,240	784	942
14	1,460	2,640	3,480	2,120	2,520	3,540	2,700	1,110	982	1,070	784	902
15	1,420	2,400	3,080	2,220	1,700	3,220	2,280	1,070	942	942	746	862
16	1,370	2,170	2,760	2,000	1,370	5,400	2,640	1,110	862	942	746	1,190
17	1,370	2,000	2,580	7,670	1,330	2,890	3,820	1,020	822	862	822	784
18	1,370	6,920	2,340	21,200	1,510	2,126	9,260	942	822	822	634	822
19	1,370	9,100	2,280	13,200	1,650	1,650	4,240	902	746	822	746	902
20	1,370	6,920	2,220	5,310	1,600	1,460	3,080	1,020	670	862	634	942
21	1,650	4,380	2,170	3,680	1,650	1,370	1,950	1,550	784	822	562	862
22	2,170	6,700	2,520	3,020	2,280	1,240	1,700	1,020	982	822	360	822
23	2,520	5,960	2,170	2,640	2,340	3,020	1,510	902	822	784	562	822
24	2,280	5,670	2,170	2,400	2,580	1,950	1,420	902	746	746	562	982
25	2,340	22,500	2,120	2,120	2,460	1,510	2,280	862	746	746	1,020	1,020
26	2,400	8,790	2,060	1,950	4,240	1,460	2,170	1,280	670	822	784	982
27	2,220	5,400	1,950	1,950	3,540	1,460	1,900	982	670	784	746	942
28	2,640	4,030	1,950	2,000	2,120	1,190	1,510	942	708	784	902	942
29	12,900	.....	2,000	1,900	1,650	1,110	1,370	862	784	784	1,190	942
30	6,590	.....	1,950	1,850	1,510	1,550	1,370	784	1,190	784	862	1,110
31	4,310	.....	1,950	.....	1,330	.....	1,240	2,280	.....	784	.....	1,150

NOTE.—These discharges were obtained from a well-defined rating curve.

Monthly discharge of Ocmulgee River at Macon, Ga., for 1910.

[Drainage area, 2,420 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	12,900	1,370	2,330	0.963	1.11	A
February	22,500	1,750	4,570	1.89	1.97	A
March	36,300	1,950	5,330	2.20	2.54	B
April	21,200	1,420	3,280	1.36	1.52	A
May	4,240	1,330	1,850	.764	.88	A
June	5,400	1,110	1,930	.798	.89	A
July	11,300	1,240	4,400	1.82	2.10	A
August	3,280	784	1,260	.521	.60	A
September	3,340	670	1,190	.492	.55	A
October	3,610	746	1,130	.467	.54	A
November	1,190	360	785	.324	.36	B
December	1,700	784	1,040	.430	.50	A
The year	36,300	360	2,410	.996	13.56	

OCONEE RIVER NEAR GREENSBORO, GA.

This station, which is located at the new wagon bridge about 5 miles west of Greensboro on the road to Madison, Ga., was established July 25, 1903.

Town Creek enters above the station. The operation of a number of mills and factories above may cause considerable fluctuation in the low-water flow, but the gage is read twice a day, and the mean of the two readings is believed to be sufficiently accurate.

The chain gage is attached to the downstream lower chord of the bridge from which measurements are made. The datum has not changed since the establishment of the station. The left bank is low and overflows at a stage of about 12 to 15 feet for a distance of about 600 feet.

Discharge measurements of Oconee River near Greensboro, Ga., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 20	E. H. Swett	122	457	2.71	856
20	do	122	454	2.70	857
Apr. 30	M. R. Hall	120	507	2.82	909
30	do	120	515	2.76	897
Oct. 28	do	115	334	1.74	516
28	do	115	345	1.74	533

Daily gage height, in feet, of Oconee River near Greensboro, Ga., for 1910.

[A. M. Thurmond, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.95	4.2	16.3	3.2	2.7	2.45	.....	2.45	6.9	2.9	1.75	1.85
2	2.95	3.75	17.8	3.15	2.6	2.25	.....	2.45	8.7	2.75	1.85	1.75
3	2.9	3.7	14.8	2.9	2.55	2.5	.....	2.3	6.5	2.3	1.75	1.6
4	2.75	3.8	8.0	2.95	2.45	3.2	.....	2.3	5.8	2.0	1.8	1.7
5	2.75	3.65	5.7	2.95	2.4	3.5	.....	3.35	4.1	1.9	1.7	2.15
6	2.7	3.3	5.2	2.85	2.35	3.95	8.3	3.25	2.65	1.75	1.8	6.5
7	3.1	3.1	4.8	2.85	2.25	3.7	7.5	3.25	2.55	2.0	1.7	6.6
8	2.7	3.05	4.4	2.65	3.7	3.25	8.9	3.95	2.35	5.7	1.8	4.4
9	3.05	3.15	4.2	2.65	3.4	2.65	11.6	3.45	2.35	5.3	1.8	3.75
10	3.05	3.15	4.2	2.45	3.25	2.6	9.5	2.75	2.85	4.7	1.7	3.1
11	2.8	3.25	4.4	2.45	2.85	2.75	6.2	2.5	2.75	3.25	1.75	2.75
12	2.8	4.3	4.8	2.45	2.9	6.2	5.2	2.25	2.55	2.85	1.75	2.55
13	2.75	4.2	4.9	2.95	2.75	6.2	4.9	2.15	2.35	2.6	1.65	2.35
14	2.75	3.75	4.8	2.9	2.35	8.2	4.4	2.15	2.1	2.2	1.75	2.1
15	2.75	3.65	3.8	3.2	2.35	9.2	4.0	2.1	2.05	2.2	1.75	2.05
16	2.65	3.4	3.75	4.7	2.35	8.9	4.2	1.85	1.95	2.1	1.75	2.1
17	2.65	3.8	3.45	9.8	2.35	6.8	3.75	1.85	1.75	2.1	1.8	2.05
18	2.6	9.8	3.45	8.6	2.6	4.7	3.55	2.15	1.75	2.15	1.8	2.15
19	2.75	10.8	3.4	5.8	3.0	3.65	3.5	2.3	1.65	1.85	1.8	2.25
20	2.7	10.4	3.35	4.5	4.0	3.25	3.45	2.3	1.65	1.6	1.7	2.2
21	4.0	6.6	3.55	3.9	5.1	4.0	3.35	2.05	1.85	1.75	1.75	2.1
22	4.1	7.8	3.55	3.6	4.6	6.2	3.2	2.0	1.75	1.75	1.75	2.15
23	3.85	6.4	3.45	3.25	4.4	4.5	3.25	1.95	2.4	1.6	1.75	2.3
24	4.2	11.2	3.5	3.05	4.6	3.4	3.0	1.75	3.3	1.6	1.8	2.45
25	4.3	11.7	3.4	2.85	6.0	3.2	2.85	2.15	4.3	1.65	1.85	2.55
26	3.75	7.8	3.35	3.1	5.5	2.75	3.0	1.95	2.45	1.65	1.85	2.6
27	7.0	5.4	3.2	2.95	3.8	2.55	2.85	1.85	2.15	1.65	1.7	2.55
28	10.8	7.7	3.2	2.95	3.15	2.55	2.8	1.8	2.1	1.85	1.85	2.3
29	10.9	.....	3.35	2.9	2.75	3.75	2.75	1.8	2.5	1.7	1.95	2.45
30	6.8	.....	3.25	2.75	2.65	11.0	2.6	3.35	2.95	1.75	2.0	2.65
31	5.2	.....	3.1	.....	2.6	.....	2.5	6.4	.....	1.7	.....	2.55

Daily discharge, in second-feet, of Oconee River near Greensboro, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	951	1,460	9,300	1,050	856	764	8,000	764	2,820	932	524	556
2	951	1,270	10,500	1,030	818	692	10,000	764	3,900	875	556	524
3	932	1,250	8,180	932	800	782	9,400	710	2,600	710	524	476
4	875	1,290	3,470	951	764	1,050	7,800	710	2,220	606	540	508
5	875	1,230	2,180	951	746	1,170	5,400	1,110	1,410	572	508	657
6	856	1,090	1,920	913	728	1,350	3,650	1,070	837	524	540	2,600
7	1,010	1,010	1,720	913	692	1,250	3,170	1,070	800	606	508	2,660
8	856	990	1,540	837	1,250	1,070	4,020	1,350	728	2,180	540	1,540
9	990	1,030	1,460	837	1,130	837	5,830	1,150	728	1,980	540	1,270
10	990	1,030	1,460	764	1,070	818	4,420	875	913	1,680	508	1,010
11	894	1,070	1,540	764	913	875	2,440	782	875	1,070	524	875
12	894	1,360	1,720	764	932	2,440	1,920	692	800	913	524	800
13	875	1,460	1,780	951	875	2,440	1,780	657	728	818	492	728
14	875	1,270	1,720	932	728	3,590	1,540	657	640	674	524	640
15	875	1,230	1,290	1,050	728	4,220	1,370	640	623	674	524	623
16	837	1,130	1,270	1,680	728	4,020	1,460	556	589	640	524	640
17	837	1,230	1,150	4,610	728	2,770	1,270	556	524	640	540	623
18	818	4,610	1,150	3,830	818	1,680	1,190	657	524	657	540	657
19	875	5,270	1,130	2,220	970	1,230	1,170	710	492	556	540	692
20	856	5,000	1,110	1,590	1,370	1,070	1,150	710	492	476	508	674
21	1,370	2,660	1,190	1,330	1,880	1,370	1,110	623	556	524	524	640
22	1,410	3,350	1,190	1,210	1,640	2,440	1,050	606	524	524	524	657
23	1,310	2,550	1,150	1,070	1,540	1,590	1,070	589	746	476	524	710
24	1,460	5,550	1,170	990	1,640	1,130	970	524	1,090	476	540	764
25	1,500	5,900	1,130	913	2,330	1,050	913	657	1,500	492	556	800
26	1,270	3,350	1,110	1,010	2,080	875	970	589	764	492	556	818
27	2,880	2,020	1,050	951	1,290	800	913	556	657	492	508	800
28	5,270	3,290	1,050	951	1,030	800	894	540	640	552	556	710
29	5,340	.....	1,110	932	875	875	875	540	782	508	589	764
30	2,770	.....	1,070	875	837	5,410	818	1,110	951	524	606	837
31	1,920	.....	1,010	.....	818	.....	782	2,550	.....	508	.....	800

NOTE.—These discharges were obtained from a rating curve which is fairly well defined below 6,000 second-feet. Discharges July 1–5 estimated by means of a hydrograph comparison with the other Oconee River stations.

Monthly discharge of Oconee River near Greensboro, Ga., for 1910.

[Drainage area, 1,100 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	5,340	818	1,430	1.30	1.50	A
February	5,900	990	2,290	2.08	2.17	A
March	10,500	1,010	2,190	1.99	2.29	A
April	4,610	764	1,260	1.15	1.28	A
May	2,330	692	1,080	.982	1.13	A
June	5,410	692	1,680	1.53	1.71	A
July	[a] 10,000	782	2,820	2.56	2.95	B
August	2,550	524	809	.735	.85	A
September	3,900	492	1,050	.955	1.07	A
October	2,180	476	753	.685	.79	A
November	606	492	534	.485	.54	A
December	2,660	476	873	.794	.92	A
The year	10,500	476	1,390	1.26	17.20	

[a] Estimated.

OCONEE RIVER AT FRALEYS FERRY, NEAR MILLEDGEVILLE, GA.

This station is located at Fraleys Ferry, 6 miles above Milledgeville Ga., and about 4 miles below the mouth of Little River. It was established May 23, 1906, to take the place of the Milledgeville station. Records were discontinued December 31, 1908, but were resumed October 6, 1909. A temporary gage was maintained from October 20, 1905, to November 14, 1905, at Fraleys Ferry, and the original station at Milledgeville was maintained from August 22, 1903, to December 31, 1905. The Milledgeville station is now maintained by the United States Weather Bureau, but on account of the daily fluctuation caused by a milldam above and the shifting channel at the station, mean monthly discharges have not been computed since 1904. At Fraleys Ferry, which is far above the influence of the dam at Milledgeville, the flow is only slightly affected by dams from above. Two gage readings a day are made in order to average any daily fluctuations which may occur.

The sloping staff gage is located 100 feet above the ferry at which discharge measurements are made. Owing to swiftness of current it has been impossible to make any measurements at high-water stages. The bed of the stream is sandy and changing, but rock shoals below control the water level at the station and a good rating has been developed for low stages.

Daily gage height, in feet, of Oconee River at Fraleys Ferry, near Milledgeville, Ga., for 1910.

[H. A. Taylor, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.7	7.0	.....	6.1	6.0	5.5	.....	5.6	6.6	5.6	5.2	5.3
2	5.75	6.5	.....	6.05	5.85	5.4	.....	5.6	7.7	5.5	5.2	5.3
3	5.75	6.55	.....	6.1	5.8	5.35	.....	5.45	7.6	5.45	5.2	5.2
4	5.8	6.75	.....	6.05	5.8	5.5	.....	5.4	7.8	5.3	5.2	5.2
5	5.8	6.6	8.0	6.0	5.7	5.7	.....	6.35	6.85	5.2	5.2	5.45
6	5.75	5.95	7.5	6.0	5.7	5.85	.....	5.9	6.1	5.2	5.2	7.0
7	6.0	6.3	7.2	5.9	5.65	6.45	8.1	5.8	5.7	5.1	5.3	7.3
8	6.35	6.2	7.0	5.9	5.95	6.2	8.0	5.9	5.5	9.1	5.2	6.9
9	6.4	6.1	6.9	5.85	6.55	5.75	8.6	6.05	5.45	8.3	5.2	6.25
10	6.1	6.2	6.8	5.85	6.4	5.55	8.8	5.75	5.55	7.2	5.2	5.85
11	6.0	6.4	6.8	5.8	6.2	5.5	7.7	5.45	6.25	6.4	5.2	5.8
12	5.85	7.4	7.0	5.8	5.95	7.1	7.2	5.5	5.9	5.85	5.2	5.7
13	5.85	7.1	7.0	5.9	6.7	7.4	6.8	5.4	5.75	5.65	5.2	5.6
14	5.8	6.65	6.85	6.15	6.35	8.0	6.45	5.4	5.45	5.5	5.2	5.5
15	5.8	6.5	6.65	5.95	6.05	.....	6.65	5.3	5.35	5.4	5.2	5.4
16	5.8	6.4	6.5	5.9	5.75	8.6	6.6	5.3	5.3	5.4	5.2	5.4
17	5.8	6.45	6.45	8.5	5.7	7.8	6.55	5.3	5.2	5.4	5.2	5.4
18	5.75	8.6	6.4	.....	5.8	6.9	6.6	5.2	5.1	5.3	5.2	5.45
19	5.75	.....	6.4	8.3	5.85	6.3	6.95	5.2	5.1	5.3	5.2	5.75
20	5.8	.....	6.4	7.2	6.0	6.05	6.75	5.2	5.1	5.25	5.3	5.75
21	6.3	.....	6.4	6.65	6.45	6.05	6.45	5.5	5.1	5.1	5.4	5.6
22	6.8	.....	6.6	6.45	7.0	6.8	6.0	5.3	5.0	5.1	5.4	5.5
23	6.55	.....	6.4	6.3	6.5	6.65	5.85	5.2	5.05	5.1	5.3	5.4
24	6.4	.....	6.3	6.2	6.15	6.3	6.0	5.2	5.1	5.1	5.3	5.5
25	6.8	.....	6.25	6.1	6.55	6.0	6.45	5.3	5.9	5.1	5.3	5.8
26	6.6	.....	6.25	6.1	7.1	6.05	5.9	5.45	5.85	5.1	5.3	5.9
27	6.4	8.2	6.2	6.1	6.55	5.85	5.75	5.35	5.3	5.1	5.3	5.7
28	7.6	8.2	6.2	6.1	6.05	5.7	5.8	5.2	5.25	5.1	5.45	5.6
29	(1)	.....	6.15	6.1	5.85	6.5	5.8	5.1	5.25	5.1	5.6	5.6
30	(1)	.....	6.15	6.0	5.7	7.8	5.7	5.1	5.35	5.1	5.4	5.65
31	8.0	.....	6.1	.....	5.6	.....	5.7	5.35	.....	5.2	.....	5.9

NOTE.—Water was over the gage on days for which no gage heights are given.

Daily discharge, in second-feet, of Oconee River at Fraleys Ferry, near Milledgeville, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,740	3,770	9,800	2,300	2,150	1,490	7,000	1,610	3,080	1,610	1,170	1,270
2	1,800	2,920	11,600	2,220	1,940	1,380	9,000	1,610	5,070	1,490	1,170	1,270
3	1,800	3,000	13,000	2,300	1,870	1,320	10,800	1,440	4,880	1,440	1,170	1,170
4	1,870	3,340	10,400	2,220	1,870	1,490	12,000	1,380	5,260	1,270	1,170	1,170
5	1,870	3,080	5,650	2,150	1,740	1,740	10,800	2,680	3,500	1,170	1,170	1,440
6	1,800	2,080	4,690	2,150	1,740	1,940	8,800	2,010	2,300	1,170	1,170	3,770
7	2,150	2,600	4,130	2,010	1,680	2,840	5,850	1,870	1,740	1,080	1,270	4,310
8	2,680	2,450	3,770	2,010	2,080	2,450	5,650	2,010	1,490	7,860	1,170	3,590
9	2,760	2,300	3,590	1,940	3,000	1,800	6,850	2,220	1,440	6,250	1,170	2,520
10	2,300	2,450	3,420	1,940	2,760	1,550	7,250	1,800	1,550	4,130	1,170	1,940
11	2,150	2,760	3,420	1,870	2,450	1,490	5,070	1,440	2,520	2,760	1,170	1,870
12	1,940	4,500	3,770	1,870	2,080	3,950	4,130	1,490	2,010	1,940	1,170	1,740
13	1,940	3,950	3,770	2,010	3,250	4,500	3,420	1,380	1,800	1,680	1,170	1,610
14	1,870	3,160	3,500	2,380	2,680	5,650	2,840	1,380	1,440	1,490	1,170	1,490
15	1,870	2,920	3,160	2,080	2,220	9,000	3,160	1,270	1,320	1,380	1,170	1,380
16	1,870	2,760	2,920	2,010	1,800	6,850	3,080	1,270	1,270	1,380	1,170	1,380
17	1,870	2,840	2,840	6,650	1,740	5,260	3,000	1,270	1,170	1,380	1,170	1,380
18	1,800	6,850	2,760	8,200	1,870	3,590	3,080	1,170	1,080	1,270	1,170	1,440
19	1,800	8,800	2,760	6,250	1,940	2,600	3,680	1,170	1,080	1,270	1,170	1,800
20	1,870	9,700	2,760	4,130	2,150	2,220	3,320	1,170	1,080	1,220	1,270	1,800
21	2,600	9,100	2,760	3,160	2,840	2,220	2,840	1,490	1,080	1,080	1,380	1,610
22	3,420	8,400	3,080	2,840	3,770	3,420	2,150	1,270	990	1,080	1,380	1,490
23	3,000	8,200	2,760	2,600	2,920	3,160	1,940	1,170	1,040	1,080	1,270	1,380
24	2,760	8,800	2,600	2,450	2,380	2,600	2,150	1,170	1,080	1,080	1,270	1,490
25	3,420	9,600	2,520	2,300	3,000	2,150	2,840	1,270	2,010	1,080	1,270	1,870
26	3,080	10,000	2,520	2,300	3,950	2,220	2,010	1,440	1,940	1,080	1,270	2,010
27	2,760	6,050	2,450	2,300	3,000	1,940	1,800	1,320	1,270	1,080	1,270	1,740
28	4,880	6,050	2,450	2,300	2,220	1,740	1,870	1,170	1,220	1,080	1,440	1,610
29	.....	.....	2,380	2,300	1,940	2,920	1,870	1,080	1,220	1,080	1,610	1,610
30	.....	.....	2,380	2,150	1,740	5,260	1,740	1,080	1,320	1,080	1,380	1,680
31	5,650	.....	2,300	.....	1,610	.....	1,740	1,320	.....	1,170	.....	2,010

NOTE.—These discharges were obtained from a rating curve which is well defined below 5,600 second-feet. Discharges for days when water was over the gage, estimated by means of a hydrograph comparison with the other Oconee River stations.

Monthly discharge of Oconee River at Fraleys Ferry, near Milledgeville, Ga., for 1910.

[Drainage area, 2,840 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	a 8,300	1,740	2,810	0.989	1.14	A
February	a 10,000	2,080	5,090	1.79	1.86	B
March	a 13,000	2,300	4,190	1.48	1.71	B
April	a 8,200	1,870	2,780	.979	1.09	A
May	3,950	1,610	2,330	.824	.95	A
June	a 9,000	1,320	3,020	1.06	1.18	A
July	a 12,000	1,740	4,570	1.61	1.86	B
August	2,680	1,080	1,470	.518	.60	A
September	5,260	990	1,940	.684	.76	A
October	7,860	1,080	1,780	.627	.72	A
November	1,610	1,170	1,240	.437	.49	A
December	4,310	1,170	1,830	.644	.74	A
The year	13,000	990	2,740	.964	13.10	

a Estimated.

OCONEE RIVER AT DUBLIN, GA.

This station is located at the iron highway bridge in the eastern part of Dublin. Continuous records of gage heights have been obtained at this point since February 11, 1898, supplied for most of the time by the United States Weather Bureau. Fragmentary records of gage heights and discharge measurements were obtained prior to 1898.

The staff gage is attached to the lower part of the Wrightsville & Tennille Railroad bridge, 500 feet downstream from the highway bridge at which measurements are made. Its datum has remained the same since its establishment.

Fluctuation caused by water powers above the station are unimportant. This portion of the river is navigable, and although the current is good at the station the slope below is small; it is therefore to be expected that rapidly rising or falling stages will cause much difference in surface slope and consequently in the discharge.

At a stage of about 20 feet the left bank overflows for 1,100 feet through an iron frame trestle approach to the bridge. This ground is thickly covered with brushy growth, which probably retards the flow of water over the overflow section. The right bank does not overflow.

Discharge measurements of Oconee River at Dublin, Ga., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 26	M. R. Hall	227	1,250	1.91	2,880
26	do	227	1,260	1.83	2,860
Nov. 10	do	195	799	−.14	1,360
10	do	195	810	−.13	1,400

Daily gage height, in feet, of Oconee River at Dublin, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.5	7.5	14.9	2.0	1.5	1.5	2.9	0.8	−0.3	0.7	−0.5	0.5
2	1.1	10.0	14.3	1.6	1.5	1.2	6.8	.5	.4	.6	− .5	.2
3	1.2	10.4	12.4	1.4	1.4	1.0	8.1	.4	3.5	.3	− .5	.1
4	1.2	6.9	11.6	1.3	.8	− .1	9.3	.4	4.6	.3	− .5	.1
5	1.2	4.9	13.3	1.3	.7	− .2	12.0	.4	4.8	.3	− .5	.0
6	1.2	3.6	15.6	1.3	.5	− .2	13.5	.3	5.2	.2	− .5	.0
7	1.4	3.6	15.3	1.2	.6	.6	14.0	1.8	3.2	.2	− .5	.4
8	1.3	3.4	13.4	1.2	.5	1.2	14.5	1.3	1.4	.3	− .4	3.8
9	1.8	2.8	9.6	1.1	.8	2.2	14.1	1.0	.4	3.3	− .3	3.1
10	2.3	2.6	5.0	1.1	2.2	1.2	12.0	1.3	.1	6.0	− .3	3.1
11	2.1	2.0	3.8	1.0	2.0	.6	10.3	1.0	.3	6.5	− .1	2.7
12	1.5	2.9	3.8	.9	1.7	.8	8.4	.7	.5	5.1	− .2	1.1
13	1.3	4.6	4.2	.9	1.5	1.0	7.6	.5	1.1	2.7	− .2	1.2
14	1.2	5.2	4.2	.9	1.3	4.0	6.4	.4	.9	2.0	− .3	1.1
15	1.2	4.5	4.1	1.0	1.2	7.2	4.2	.1	.5	.8	− .3	1.1
16	1.2	3.2	3.2	1.3	1.6	9.6	3.3	.1	.1	.4	− .3	.6
17	1.2	3.2	3.4	1.6	1.2	10.6	3.4	.0	− .1	.3	− .3	.4
18	1.2	3.5	2.7	3.8	.6	10.7	3.1	.0	− .2	.3	− .3	.3
19	1.2	6.4	2.2	6.0	.6	10.0	4.4	.0	− .3	.3	− .3	.4
20	1.4	7.1	2.2	7.5	.6	7.8	5.1	− .1	− .4	.3	.1	.9
21	1.7	7.8	2.3	9.0	.8	3.2	4.8	− .1	− .4	.2	.3	1.0
22	2.1	8.7	2.4	9.7	1.0	2.3	4.3	− .2	− .5	.4	.3	1.1
23	3.1	9.2	2.4	6.3	2.3	3.0	3.0	− .2	− .5	.4	.2	.9
24	3.9	9.9	2.2	3.3	2.7	3.3	2.4	− .2	− .5	− .1	.2	.7
25	2.7	10.4	2.2	2.6	2.8	2.8	1.9	− .2	− .6	− .3	.1	.6
26	2.9	11.0	2.2	2.0	2.7	2.2	2.8	− .3	− .6	− .4	.1	.6
27	2.9	11.8	2.1	1.7	2.5	1.9	2.4	− .3	1.1	− .4	.1	.8
28	3.1	13.3	2.2	1.6	2.4	1.4	1.4	− .2	1.0	− .4	.1	1.0
29	3.4	.....	2.2	1.6	2.2	1.2	.9	− .3	.8	− .5	.1	.7
30	6.8	.....	2.1	1.6	1.7	1.1	1.1	− .4	.6	− .5	.1	.6
31	7.5	.....	2.1	.....	1.7	.....	1.0	− .4	.....	− .5	.....	.6

Daily discharge, in second-feet, of Oconee River at Dublin, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,560	8,540	19,600	2,980	2,560	2,560	3,740	2,000	1,200	1,920	1,070	1,770
2	2,240	11,900	18,600	2,640	2,560	2,320	7,690	1,770	1,700	1,840	1,070	1,540
3	2,320	12,500	15,500	2,480	2,480	2,160	9,310	1,700	4,280	1,620	1,070	1,470
4	2,320	7,810	14,300	2,400	2,000	1,330	10,900	1,700	5,320	1,620	1,070	1,470
5	2,320	5,620	17,000	2,400	1,920	1,260	14,900	1,700	5,520	1,620	1,070	1,400
6	2,320	4,370	20,800	2,400	1,770	1,260	17,300	1,620	5,920	1,540	1,070	1,400
7	2,480	4,370	20,300	2,320	1,840	1,840	18,100	2,800	4,010	1,540	1,070	1,700
8	2,400	4,190	17,100	2,320	1,770	2,320	19,000	2,400	2,480	1,620	1,140	4,560
9	2,800	3,660	11,300	2,240	2,000	3,140	18,300	2,160	1,700	4,100	1,200	3,920
10	3,230	3,480	5,720	2,240	3,140	2,320	14,900	2,400	1,470	6,780	1,200	3,920
11	3,060	2,980	4,560	2,160	2,980	1,840	12,400	2,160	1,620	7,340	1,330	3,570
12	2,560	3,740	4,560	2,080	2,720	2,000	9,760	1,920	1,770	5,820	1,260	2,240
13	2,400	5,320	4,940	2,080	2,560	2,160	8,670	1,770	2,240	3,570	1,260	2,320
14	2,320	5,920	4,940	2,080	2,400	4,740	7,230	1,700	2,080	2,980	1,260	2,240
15	2,320	5,220	4,840	2,160	2,320	8,170	4,940	1,470	1,770	2,000	1,200	2,240
16	2,320	4,010	4,010	2,400	2,640	11,300	4,100	1,470	1,470	1,700	1,200	1,840
17	2,320	4,010	4,190	2,640	2,320	12,800	4,190	1,400	1,330	1,620	1,200	1,700
18	2,320	4,280	3,570	4,560	1,840	13,000	3,920	1,400	1,260	1,620	1,200	1,620
19	2,320	7,230	3,140	6,780	1,840	11,900	5,120	1,400	1,200	1,620	1,200	1,700
20	2,480	8,050	3,140	8,540	1,840	8,920	5,820	1,330	1,140	1,620	1,470	2,080
21	2,720	8,920	3,230	10,500	2,000	4,010	5,520	1,330	1,140	1,540	1,620	2,160
22	3,060	10,100	3,320	11,500	2,160	3,230	5,030	1,260	1,070	1,700	1,620	2,240
23	3,920	10,800	3,320	7,120	3,230	3,830	3,830	1,260	1,070	1,700	1,540	2,080
24	4,650	11,800	3,140	4,100	3,570	4,100	3,320	1,260	1,070	1,330	1,540	1,920
25	3,570	12,500	3,140	3,480	3,660	3,660	2,890	1,260	1,000	1,200	1,470	1,840
26	3,740	13,400	3,140	2,980	3,570	3,140	3,660	1,200	1,000	1,140	1,470	1,840
27	3,740	14,600	3,060	2,720	3,400	2,890	3,320	1,200	2,240	1,140	1,470	2,000
28	3,920	17,000	3,140	2,640	3,320	2,480	2,480	1,260	2,160	1,140	1,470	2,160
29	4,190	.....	3,140	2,640	3,140	2,320	2,080	1,200	2,000	1,070	1,470	1,920
30	7,690	.....	3,060	2,640	2,720	2,240	2,240	1,140	1,840	1,070	1,470	1,840
31	8,540	.....	3,060	.....	2,720	.....	2,160	1,140	.....	1,070	.....	1,840

NOTE.—These discharges were obtained from a rating curve which is not well defined.

Monthly discharge of Oconee River at Dublin, Ga., for 1910.

[Drainage area, 4,180 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	8,540	2,240	3,200	0.766	0.88	B
February	17,060	2,980	7,730	1.85	1.93	B
March	20,800	3,060	7,640	1.83	2.11	B
April	11,500	2,080	3,670	.878	.98	B
May	3,660	1,770	2,550	.610	.70	B
June	13,000	1,260	4,310	1.03	1.15	B
July	19,060	2,080	7,640	1.83	2.11	B
August	2,800	1,140	1,610	.385	.44	B
September	5,920	1,000	2,140	.512	.57	B
October	7,340	1,070	2,200	.526	.61	B
November	1,620	1,070	1,290	.309	.34	B
December	4,560	1,400	2,150	.514	.59	B
The year	20,800	1,000	3,820	.914	12.41	

NOTE.—Intercomparisons with the other Oconee stations show rather unfavorable results for Dublin. The means appear generally low, especially for May, June, August, September, October, and November.

EASTERN GULF OF MEXICO DRAINAGE BASINS.

APALACHICOLA RIVER BASIN.

DESCRIPTION.

This Apalachicola basin is drained almost entirely by Chattahoochee and Flint rivers. These two main streams unite at the extreme southwest corner of Georgia to form Apalachicola River, which flows southward through Florida and empties into the Gulf of Mexico at Apalachicola. The basin is about 350 miles long and comprises an area of 19,500 square miles.

Chattahoochee River rises in the Blue Ridge in Lumpkin, White, and Habersham counties, Ga., near the northeast corner of the State, and flows southwestward until it reaches the Alabama line at West Point, Ga.; thence it flows southward, forming the western boundary of Georgia, until it reaches Apalachicola River at the southern boundary of the State. Its upper tributaries are Chestatee and Soque rivers, which join the Chattahoochee in Hall and Habersham counties, respectively. The basin of the Chattahoochee, which is slightly larger than that of the Flint, is peculiarly narrow, especially for the portion in the mountain and plateau regions. It lies between two ridges, higher than the country on either side, like two great levees, rescuing its water from the many encroaching tributaries of Tallulah, Broad, Oconee, Ocmulgee, and Flint rivers on the south and Ocoee, Etowah, and Tallapoosa rivers on the north. The fall line is well defined at Columbus, Ga., where the river breaks through the southern rim of its plateau basin. The greatest amount of fall after leaving the small headwater streams occurs at and immediately above Columbus. The mountain portion of the basin above Gainesville, Ga., is largely in forests and contains much land too steep

for cultivation. The Piedmont Plateau and Coastal Plain areas are mostly cleared.

Flint River rises in Fulton County, Ga., a few miles south of Atlanta, and flows in a southerly direction to Apalachicola River. It drains the south-central portion of Georgia, extending from Atlanta south to the Florida line. The principal tributaries of the Flint are Whitewater, Elkins, Big Potato, Muckalee, Kinchafoonee, Ichaway-nochaway, and Spring creeks. The upper portion of the Flint drains the granitic areas of the Piedmont Plateau, passing to the quartzites on the southern border, and, with less change in elevation than other Georgia streams, into the Coastal Plain. The fall line is not so well defined as it is on Chattahoochee River. The entire basin of the Flint is an agricultural country, and the lands are mostly cleared, both in the Plateau and Coastal Plain areas. Their roughest section, containing the most waste lands, is the pine mountain region at the southern border of the Piedmont Plateau. An unusual feature of the regimen of its flow is that the lower area contributes more low-water flow per square mile than the upper portions. The river at Albany has a greater minimum run-off per square mile than it has at Woodbury.

The mean annual rainfall for the Apalachicola basin is about 50 inches, except for the upper portion of the Chattahoochee drainage, where it reaches 60 inches.

Opportunities for water-power development are great, and in most parts of the basin the demand for power is good.

The following special reports contain information regarding the hydrography of the Apalachicola River basin:

Water resources of Georgia, by B. M. and M. R. Hall: Water-Supply Paper U. S. Geol. Survey No. 197. This contains data on stream flow, river surveys, and water power collected prior to 1906.

River surveys and profiles made during 1903, by W. C. Hall and J. C. Hoyt: Water-Supply Paper U. S. Geol. Survey No. 115. This report may be obtained by applying to the Director United States Geological Survey, Washington, D. C.

Relation of southern Appalachian Mountains to the development of inland water navigation and water power: United States Forest Service circulars Nos. 143 and 144.

CHATTAHOOCHEE RIVER NEAR NORCROSS, GA.

This station, which is located at Medlocks Bridge, about 4½ miles north of Norcross, 1½ miles above the mouth of John Creek, and 5 miles below the mouth of Suwanee Creek, was established January 9, 1903, to take the place of the Oakdale station about 30 miles below, which was maintained from July 30, 1896, to May 31, 1904, when its records became unreliable on account of the Bull Sluice power plant above.

Artificially controlled flow from water powers above causes some daily fluctuation in gage heights. To eliminate the error from this source the gage is read twice a day.

The original gage was a vertical staff attached to an oak tree on the right bank about 100 feet above the gage. A chain gage, established March 14, 1903, was read in connection with the vertical gage until June 28, 1905, when a standard chain gage was installed on the toll bridge. The datum of the vertical staff gage originally used and of the present chain gage has not been changed.

The right bank is high and overflows only slightly; the left bank will overflow for about 800 feet at a gage height of 16 to 18 feet. The bed of the stream is sandy and changeable, necessitating frequent discharge measurements and occasional changes in the rating.

Since May 1, 1910, the gage heights have been furnished by the United States Weather Bureau.

Discharge measurements of Chattahoochee River near Norcross, Ga., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 28	M. R. Hall	164	1,100	2.64	1,660
28	do	164	1,090	2.62	1,640
June 23	do	166	1,230	3.46	2,430
Sept. 7	F. P. Thomas	168	1,060	2.45	1,460
7	do	168	1,080	2.41	1,390
Oct. 29	M. R. Hall	165	1,010	2.41	1,320

Daily gage height, in feet, of Chattahoochee River near Norcross, Ga., for 1910.

[W. O. Medlock, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.6	2.9	5.0	2.5	2.4	3.15	4.2	2.6	6.8	2.7	1.9	2.15
2	2.6	2.8	6.0	2.5	2.4	3.1	4.2	2.5	4.1	2.2	2.15	2.15
3	2.55	2.8	4.6	2.5	2.4	3.65	4.0	2.7	3.55	2.1	2.2	2.1
4	2.5	2.85	3.9	2.5	2.35	3.7	4.7	2.5	3.0	2.1	2.1	2.1
5	2.5	2.8	3.6	2.5	2.35	3.2	4.6	3.4	2.75	2.1	2.1	3.9
6	2.6	2.65	3.4	2.5	2.3	6.6	5.5	3.05	2.55	2.2	1.92	6.2
7	3.65	2.6	3.25	2.5	2.35	5.4	6.0	4.6	2.45	2.3	[a] 1.52	4.9
8	4.4	2.55	3.15	2.4	4.7	3.85	5.0	3.95	2.4	2.9	1.92	3.2
9	3.4	2.6	3.1	2.4	10.4	3.45	4.7	3.1	2.9	4.0	2.0	2.75
10	3.05	2.6	3.05	2.4	6.4	3.4	4.4	2.75	3.5	3.25	2.0	2.6
11	2.9	2.6	3.3	2.4	4.2	3.4	4.1	2.65	2.8	2.6	2.1	2.4
12	2.75	2.85	3.55	2.4	3.6	4.8	3.6	2.5	2.45	2.4	2.2	[a] 2.3
13	2.7	3.0	3.25	2.45	3.6	6.1	3.45	2.5	2.35	2.3	2.2	2.5
14	2.7	2.8	3.1	2.4	3.15	5.0	3.5	2.6	2.3	2.25	[a] 1.58	2.3
15	2.65	2.75	3.0	2.4	3.0	4.5	3.85	2.5	2.25	2.2	2.05	2.4
16	2.55	2.75	2.9	2.7	2.9	4.2	3.45	2.55	2.2	2.1	2.15	2.4
17	2.5	3.65	2.9	6.1	3.05	3.6	3.3	2.45	2.15	2.1	2.1	2.25
18	2.55	7.1	2.8	5.9	3.4	3.35	3.1	2.4	2.1	2.05	1.92	2.2
19	2.55	5.5	2.8	3.75	3.45	3.2	3.05	2.3	2.1	2.1	1.88	[a] 1.8
20	2.6	3.9	2.8	3.2	5.1	3.1	3.05	2.3	2.1	2.1	1.88	2.05
21	3.2	3.75	2.85	2.95	8.8	3.2	2.9	2.3	2.1	2.1	[a] 1.5	2.15
22	3.55	4.0	2.8	2.85	6.4	3.25	2.8	2.25	2.05	2.1	1.82	2.1
23	3.1	3.7	2.75	2.75	5.4	3.35	2.8	2.2	2.1	2.0	1.98	2.2
24	3.2	3.5	2.75	2.7	7.1	3.25	2.75	2.2	2.5	[a] 1.65	1.92	2.4
25	3.15	3.3	2.7	2.7	8.4	3.35	2.8	2.2	2.4	2.0	1.9	2.8
26	3.0	3.15	2.7	2.7	6.6	3.15	2.7	2.45	2.1	1.98	1.95	2.5
27	2.9	3.05	2.6	2.75	4.6	2.9	2.7	2.5	2.05	2.1	1.85	2.35
28	3.1	3.2	2.6	2.65	4.0	2.8	2.85	2.4	2.05	2.2	[a] 1.6	2.25
29	3.45	.....	2.6	2.6	3.65	4.0	2.7	2.2	2.0	2.3	2.3	2.25
30	3.3	.....	2.6	2.5	3.45	3.95	2.8	2.2	2.9	2.0	2.15	2.3
31	3.05	.....	2.6	.....	3.35	.....	2.7	3.4	.....	[a] 1.6	.....	2.4

[a] After the middle of October the low stages on Mondays were the result of stored water at the Gainesville power plant.

Daily discharge, in second-feet, of Chattahoochee River near Norcross, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,560	1,820	3,940	1,470	1,380	2,040	3,070	1,560	6,220	1,640	970	1,170
2	1,560	1,730	5,150	1,470	1,380	2,000	3,070	1,470	2,970	1,220	1,170	1,170
3	1,510	1,730	3,480	1,470	1,380	2,520	2,870	1,640	2,420	1,130	1,220	1,130
4	1,470	1,780	2,770	1,470	1,340	2,570	3,590	1,470	1,910	1,130	1,130	1,130
5	1,470	1,730	2,470	1,470	1,340	2,090	3,480	2,270	1,680	1,130	1,130	2,770
6	1,560	1,600	2,270	1,470	1,300	5,940	4,540	1,960	1,510	1,220	986	5,410
7	2,520	1,560	2,140	1,470	1,340	4,420	5,150	3,480	1,430	1,300	670	3,820
8	3,270	1,510	2,040	1,380	3,590	2,720	3,940	2,820	1,380	1,820	986	2,090
9	2,270	1,560	2,000	1,380	11,900	2,320	3,590	2,000	1,820	2,870	1,050	1,680
10	1,960	1,560	1,960	1,380	5,670	2,270	3,270	1,680	2,370	2,140	1,050	1,560
11	1,820	1,560	2,180	1,380	3,070	2,270	2,970	1,600	1,730	1,560	1,130	1,380
12	1,680	1,780	2,420	1,380	2,470	3,700	2,470	1,470	1,430	1,380	1,220	1,300
13	1,640	1,910	2,140	1,430	2,470	5,280	2,320	1,470	1,340	1,300	1,220	1,470
14	1,640	1,730	2,090	1,380	2,040	3,940	2,370	1,560	1,300	1,260	710	1,300
15	1,600	1,680	1,910	1,380	1,910	3,370	2,720	1,470	1,260	1,220	1,090	1,380
16	1,510	1,680	1,820	1,640	1,820	3,070	2,320	1,510	1,220	1,130	1,170	1,380
17	1,470	2,520	1,820	5,280	1,960	2,470	2,180	1,430	1,170	1,130	1,130	1,260
18	1,510	6,640	1,730	5,020	2,270	2,220	2,000	1,380	1,130	1,090	986	1,220
19	1,510	4,540	1,730	2,620	2,320	2,090	1,960	1,300	1,130	1,130	954	890
20	1,560	2,770	1,730	2,090	4,060	2,000	1,960	1,300	1,130	1,130	954	1,090
21	2,090	2,620	1,780	1,860	9,280	2,090	1,820	1,300	1,130	1,130	650	1,170
22	2,420	2,870	1,730	1,780	5,670	2,140	1,730	1,260	1,090	1,130	906	1,130
23	2,000	2,570	1,680	1,680	4,420	2,220	1,730	1,220	1,130	1,050	1,030	1,220
24	2,090	2,370	1,680	1,640	6,640	2,140	1,680	1,220	1,470	770	986	1,380
25	2,040	2,180	1,640	1,640	8,640	2,220	1,730	1,220	1,380	1,050	970	1,730
26	1,910	2,040	1,640	1,640	5,940	2,040	1,640	1,430	1,130	1,030	1,010	1,470
27	1,820	1,960	1,560	1,680	3,480	1,820	1,640	1,470	1,090	1,130	930	1,340
28	2,000	2,090	1,560	1,600	2,870	1,730	1,780	1,380	1,090	1,220	730	1,260
29	2,320	.....	1,560	1,560	2,520	2,870	1,640	1,220	1,050	1,300	1,300	1,260
30	2,180	.....	1,560	1,470	2,320	2,820	1,730	1,220	1,820	1,050	1,170	1,300
31	1,960	.....	1,560	.....	2,220	.....	1,640	2,270	.....	730	.....	1,380

NOTE.—These discharges were obtained from a rating curve well defined below 8,000 second-feet.

Monthly discharge of Chattahoochee River near Norcross, Ga., for 1910.

[Drainage area, 1,170 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	3,270	1,470	1,870	1.60	1.84	A
February	6,640	1,510	2,220	1.90	1.98	A
March	5,150	1,560	2,120	1.81	2.09	A
April	5,280	1,380	1,820	1.56	1.74	A
May	11,900	1,300	3,520	3.01	3.47	A
June	5,940	1,730	2,710	2.32	2.59	A
July	5,150	1,640	2,540	2.17	2.50	A
August	3,480	1,220	1,610	1.38	1.59	A
September	6,220	1,090	1,630	1.39	1.55	A
October	2,870	730	1,270	1.09	1.26	A
November	1,300	670	1,020	.872	.97	A
December	5,410	890	1,590	1.36	1.57	A
The year	11,900	670	1,990	1.70	23.15	

CHATTAHOOCHEE RIVER AT WEST POINT, GA.

This station, which is located at the Montgomery Street Bridge in West Point, was established July 30, 1896, for the purpose of obtaining run-off data especially valuable for estimating the water power afforded by the river, the best of which occurs in the 35 miles lying between West Point and Columbus, Ga.

The operation of power plants above causes some fluctuations of flow at low stages, but is not thought to affect the mean gage height seriously, as the gage is read twice a day.

The chain gage is attached to the handrail of the downstream footway, from which measurements are made. Its datum has remained the same since the station was established.

The right bank is high and overflows only at high water, when most of the town is flooded; the left bank is somewhat lower and overflows for about 800 feet at a gage height of 20 feet.

The bed is sandy and shifts considerably, but the rating curve has been good and constant owing to a rocky ledge below which has controlled the heights at the gage. During 1910 and probably part of 1909 gage heights have been affected by backwater from a new dam 4 feet higher than the old one at the water-power plant at Langdale, Ala., 5 miles below. The daily filling and lowering of the pond causes considerable variation in the relation of velocity to gage height. Besides the daily variation, which probably extends even to high water, the effect of the higher dam is to change the rating curve.

Discharge measurements of Chattahoochee River at West Point, Ga., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gauge height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 7	M. R. Hall	383	2,680	2.87	2,840
Aug. 25	F. P. Thomas	375	2,510	2.28	2,250
26	do	375	2,530	2.27	2,100
Nov. 4	M. R. Hall	371	2,180	1.80	1,690
5	do	371	2,250	1.96	1,580

Daily gage height, in feet, of Chattahoochee River at West Point, Ga., for 1910.

[A. V. Dunn, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.15	4.2	6.6	3.05	3.2	3.3	11.1	2.9	2.7	2.85	2.2	2.1
2	3.2	3.8	8.0	3.1	3.0	3.1	8.4	3.0	4.2	3.05	2.1	2.45
3	3.2	3.9	7.3	3.15	2.8	3.1	8.6	3.2	6.4	2.6	2.0	2.25
4	3.15	4.2	6.3	3.05	2.8	3.2	7.7	2.6	4.8	2.6	2.0	2.4
5	3.1	4.0	5.2	3.1	2.65	3.4	6.6	4.9	3.75	2.2	2.1	3.85
6	3.15	3.65	4.6	3.2	2.8	3.7	5.5	5.7	3.2	2.15	2.5	4.7
7	4.1	3.45	4.3	3.1	2.9	3.8	5.1	7.6	2.9	2.65	2.4	5.0
8	5.0	3.4	4.1	3.1	3.1	5.1	5.7	7.4	2.7	3.0	2.25	5.4
9	4.6	3.45	3.95	3.1	3.5	4.2	5.6	5.8	2.85	3.8	2.15	4.2
10	4.4	3.4	3.85	2.95	5.4	4.1	5.2	4.4	3.0	3.65	2.1	3.5
11	3.8	3.65	4.2	2.95	7.5	4.3	5.0	3.6	3.05	3.7	2.1	3.3
12	3.5	4.3	4.3	2.9	4.8	4.2	4.6	3.6	3.0	3.25	2.3	3.0
13	3.3	4.2	4.4	3.0	3.9	4.5	4.0	3.75	3.0	3.0	2.2	2.7
14	3.3	3.85	4.1	3.0	3.8	5.6	3.65	3.0	2.65	2.6	2.1	2.4
15	3.35	3.6	3.8	2.95	3.5	5.6	3.55	2.8	2.3	2.6	2.1	2.5
16	3.2	3.6	3.7	3.6	3.3	4.8	3.5	2.8	2.3	2.6	2.2	2.65
17	3.2	4.0	3.6	7.2	3.1	4.4	3.85	2.95	2.4	2.25	1.95	2.7
18	3.1	6.7	3.55	7.9	3.55	4.2	4.6	3.0	2.5	2.25	2.05	2.6
19	3.2	8.6	3.55	7.0	3.2	3.55	3.9	2.85	2.3	2.2	2.35	2.7
20	3.45	7.6	3.65	5.2	3.35	3.3	3.45	3.1	2.1	2.1	2.5	2.6
21	4.0	6.0	3.55	4.2	5.3	3.4	3.2	2.9	2.0	2.1	2.2	2.3
22	4.5	6.2	3.4	3.6	6.6	4.3	3.1	2.65	2.35	2.2	2.1	2.2
23	4.2	5.8	3.4	3.55	7.2	4.0	3.1	2.45	2.25	2.25	2.1	2.35
24	4.4	5.6	3.35	3.55	7.6	3.7	3.75	2.45	2.3	2.1	2.2	2.9
25	4.4	6.0	3.3	3.4	11.2	3.6	3.6	2.4	2.3	2.1	2.1	3.3
26	4.1	5.4	3.3	3.45	9.2	3.45	3.3	2.4	2.1	2.1	2.3	3.3
27	3.95	4.6	3.3	3.45	6.8	3.3	3.1	2.6	2.4	1.95	2.3	2.8
28	4.3	4.9	3.3	3.3	5.2	3.15	2.9	2.6	2.2	2.1	2.5	2.85
29	5.3	.....	3.25	3.3	4.3	3.5	2.8	2.55	2.7	2.3	2.6	2.8
30	5.1	.....	3.25	3.3	3.7	7.3	3.3	2.4	3.4	2.3	2.1	3.3
31	4.4	.....	3.2	.....	3.5	.....	3.05	2.5	.....	2.1	.....	3.4

Daily discharge, in second-feet, of Chattahoochee River at West Point, Ga., for 1910.

[A. V. Dunn, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,360	5,250	10,400	3,200	3,440	3,610	22,500	2,960	2,660	2,880	1,980	1,860
2	3,440	4,490	13,900	3,280	3,120	3,280	14,900	3,120	5,250	3,200	1,860	2,310
3	3,440	4,680	12,100	3,360	2,810	3,280	15,400	3,440	9,950	2,520	1,740	2,040
4	3,360	5,250	9,720	3,200	2,810	3,440	13,100	2,520	6,450	2,520	1,740	2,240
5	3,280	4,870	7,290	3,280	2,590	3,780	10,400	6,660	4,400	1,980	1,860	4,580
6	3,360	4,220	6,050	3,440	2,810	4,310	7,930	8,370	3,440	1,920	2,380	6,250
7	5,060	3,860	5,450	3,280	2,960	4,490	7,080	12,800	2,960	2,590	2,240	6,870
8	6,870	3,780	5,060	3,280	3,280	7,080	8,370	12,400	2,660	3,120	2,040	7,710
9	6,050	3,860	4,780	3,280	3,950	5,250	8,150	8,590	2,880	4,490	1,920	5,250
10	5,650	3,780	4,580	3,040	7,710	5,060	7,290	5,650	3,120	4,220	1,860	3,950
11	4,490	4,220	5,250	3,040	12,600	5,450	6,870	4,130	3,200	4,310	1,860	3,610
12	3,950	5,450	5,450	2,960	6,450	5,250	6,050	4,130	3,120	3,520	2,110	3,120
13	3,610	5,250	5,650	3,120	4,680	5,850	4,870	4,400	3,120	3,120	1,980	2,660
14	3,610	4,580	5,060	3,120	4,490	8,150	4,220	3,120	2,590	2,520	1,860	2,240
15	3,700	4,130	4,490	3,040	3,950	8,150	4,040	2,810	2,110	2,520	1,860	2,380
16	3,440	4,130	4,310	4,130	3,610	6,450	3,950	2,810	2,110	2,520	1,980	2,590
17	3,440	4,870	4,130	11,800	3,280	5,650	4,580	3,040	2,240	2,040	1,680	2,660
18	3,280	10,600	4,040	13,600	4,040	5,250	6,050	3,120	2,380	2,040	1,800	2,520
19	3,440	15,400	4,040	11,400	3,440	4,040	4,680	2,880	2,110	1,980	2,180	2,660
20	3,860	12,800	4,220	7,290	3,700	3,610	3,860	3,280	1,860	1,860	2,380	2,520
21	4,870	9,030	4,040	5,250	7,500	3,780	3,440	2,960	1,740	1,860	1,980	2,110
22	5,850	9,490	3,780	4,130	10,400	5,450	3,280	2,590	2,180	1,980	1,860	1,980
23	5,250	8,590	3,780	4,040	11,800	4,870	3,280	2,310	2,040	2,040	1,860	2,180
24	5,650	8,150	3,700	4,040	12,800	4,310	4,400	2,310	2,110	1,860	1,980	2,960
25	5,650	9,030	3,610	3,780	22,800	4,130	4,130	2,240	2,110	1,860	1,860	3,610
26	5,060	7,710	3,610	3,860	17,000	3,860	3,610	2,240	1,860	1,860	2,110	3,610
27	4,780	6,050	3,610	3,860	10,900	3,610	3,280	2,520	2,240	1,680	2,110	2,810
28	5,450	6,660	3,610	3,610	7,290	3,360	2,960	2,520	1,980	1,860	2,380	2,880
29	7,500	.....	3,520	3,610	5,450	3,950	2,810	2,450	2,660	2,110	2,520	2,810
30	7,080	.....	3,520	3,610	4,310	12,100	3,610	2,240	3,780	2,110	1,860	3,610
31	5,650	.....	3,440	.....	3,950	.....	3,200	2,380	.....	1,860	.....	3,780

NOTE.—These discharges were obtained from a rating curve which is fairly well defined below 22,200 second-feet.

Monthly discharge of Chattahoochee River at West Point, Ga., for 1910.

[Drainage area, 3,300 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	7,500	3,280	4,630	1.40	1.61	B
February	15,400	3,780	6,440	1.95	2.03	B
March	13,900	3,440	5,360	1.62	1.87	B
April	13,600	2,960	4,530	1.37	1.53	B
May	22,800	2,590	6,450	1.95	2.25	B
June	12,100	3,280	5,030	1.52	1.70	B
July	22,500	2,810	6,530	1.98	2,28	B
August	12,800	2,240	4,100	1.24	1.43	B
September	9,950	1,740	3,040	.921	1.03	B
October	4,490	1,680	2,480	.752	.87	B
November	2,520	1,680	1,990	.603	.67	B
December	7,710	1,860	3,300	1.00	1.15	B
The year	22,800	1,680	4,480	1.36	18.42	

CHATTAHOOCHEE RIVER AT ALAGA, ALA.

This station, which is located at the Atlantic Coast Line Railway bridge one-fourth mile east of Alaga, 4 miles east of Gordon, and one-half mile west of Saffold, Ga., is about 35 miles above the junction of Chattahoochee and Flint rivers. The station was originally established in 1904 by the United States Weather Bureau and discharge measurements were begun by the United States Geological Survey June 15, 1908. On this date the gage-chain length was determined and its datum referred to a reference point on the iron bridge, accepting the chain length as it was. The original datum could not be determined, although the chain had no doubt stretched somewhat.

The river is navigable from its mouth to Columbus, Ga., a long distance above the station. Conditions of flow are probably changing on account of silting of the river bed.

Only three low-water measurements have been made at this station, one in 1908 and two in 1909. No rating curve has yet been developed.

Daily gage height, in feet, of Chattahoochee River near Alaga, Ala., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.3	10.0	13.6	4.7	5.4	5.2	5.4	4.2	2.5	1.7	1.1	2.5
2	3.9	8.2	24.0	4.5	5.1	4.6	6.8	5.2	2.5	1.7	1.2	2.4
3	3.6	6.8	22.5	4.5	4.9	4.2	15.5	4.4	3.4	3.0	1.4	2.2
4	3.6	6.1	18.5	4.3	4.8	3.9	14.7	3.8	4.0	2.4	1.2	1.8
5	3.8	6.3	15.2	4.1	4.4	3.7	16.2	3.8	8.1	2.4	1.2	1.6
6	3.4	7.8	12.5	4.4	4.2	3.6	15.4	4.1	8.0	2.1	1.4	1.8
7	3.7	7.0	10.6	4.3	4.0	3.7	12.8	6.1	5.5	2.2	1.4	2.5
8	4.2	5.9	9.2	4.3	3.9	4.5	9.9	8.8	4.3	2.4	1.2	5.7
9	5.3	5.3	8.5	4.3	3.9	4.9	8.8	9.7	3.3	2.5	1.4	6.6
10	6.8	4.9	7.8	4.0	4.3	5.7	9.2	11.6	3.0	2.9	1.9	6.5
11	6.3	4.9	7.4	3.8	5.3	8.1	9.3	9.3	4.1	3.7	1.7	6.0
12	6.2	5.6	7.4	3.7	5.3	7.5	8.4	7.3	4.9	4.0	1.5	5.6
13	5.4	6.6	8.4	4.1	9.6	8.0	8.0	5.5	4.1	3.9	1.4	4.6
14	4.6	7.7	8.7	5.9	8.4	7.8	8.1	4.6	3.6	3.8	1.2	3.3
15	4.2	7.3	8.1	5.7	5.8	7.1	6.7	5.3	3.2	3.1	1.1	3.0
16	4.0	6.3	7.4	5.0	5.1	7.6	5.6	4.6	3.1	2.5	1.0	2.5
17	3.8	5.5	6.7	7.8	4.8	8.7	5.1	3.5	3.0	2.0	1.5	2.5
18	3.6	6.2	6.3	26.4	4.4	7.8	5.2	3.4	2.5	1.8	1.3	2.1
19	3.7	12.2	6.0	27.6	4.1	6.4	6.3	3.3	1.9	1.6	1.6	2.9
20	3.6	15.0	5.8	23.0	4.1	5.6	10.6	3.6	1.5	1.7	2.1	2.9
21	3.7	14.8	5.7	15.7	4.3	4.8	9.5	3.9	1.6	1.4	2.1	2.9
22	4.3	13.8	5.7	11.1	4.0	4.4	7.2	3.6	2.0	1.3	1.6	2.8
23	4.7	13.8	5.7	8.7	5.7	4.9	5.6	3.2	1.5	1.2	1.8	2.0
24	6.0	13.7	5.5	7.5	8.3	6.7	5.6	3.3	1.4	1.0	2.0	2.6
25	6.0	14.2	5.4	6.8	9.7	6.6	6.1	2.7	1.7	.9	1.6	2.0
26	6.0	16.9	5.2	6.4	11.0	6.1	6.0	2.5	1.6	.9	1.5	1.9
27	6.0	14.6	5.1	6.1	15.1	5.2	6.6	2.3	1.4	1.1	1.2	2.7
28	5.8	12.0	5.1	5.6	14.1	5.0	5.6	2.2	1.4	1.3	1.4	2.7
29	8.3	.....	4.9	5.6	10.4	4.7	5.0	2.1	1.5	1.4	1.9	2.6
30	13.0	.....	4.9	5.5	8.1	4.3	4.4	1.8	1.4	1.3	1.9	2.8
31	12.0	.....	4.8	.....	6.2	.....	3.9	2.0	.....	1.2	.....	3.5

FLINT RIVER NEAR WOODBURY, GA.

This station, which is located at the Macon & Birmingham Railroad bridge 3 miles east of Woodbury, Ga., was established March 29, 1900. It is below the mouth of Elkins Creek and above Cane Creek.

Up to June 30, 1910, the gage was read twice a day to eliminate or lessen the effect of fluctuations which may be caused by the operation of power plants above, but since that time the gage heights have been furnished by the United States Weather Bureau and the readings have been made once a day.

The vertical staff gage is located 300 feet above the Macon & Birmingham Railroad bridge, from which discharge measurements are usually made. The datum of the gage, which is 660 feet above sea level, has remained the same since the establishment of the station. Above gage height 10 feet the banks are subject to overflow for a width of about 350 feet, but all water passes beneath the bridge and its approaches.

Discharge measurements of Flint River near Woodbury, Ga., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 25	M. R. Hall	278	990	1.18	955
25	.....do	278	990	1.18	931

Daily gage height, in feet, of Flint River near Woodbury, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	0.9	1.85	6.0	1.0	0.9	0.5	1.2	0.5	0.5	1.1	0.2
2	.9	1.55	4.6	.9	.85	.4	2.0	.4	.6	.....	.3
3	.9	1.65	4.6	.9	.8	.4	2.8	.5	.7	.5	.3
4	.9	2.05	3.6	.9	.8	.4	2.8	.5	.....	.4	.3
5	.9	1.75	2.8	.9	.7	.45	3.1	.8	1.6	.3	.3
6	.9	1.55	2.2	.9	.7	.65	3.2	1.5	1.4	.3	.....
7	1.45	1.35	1.85	.9	.7	.8	2.5	1.2	1.3	.3	.6
8	1.45	1.2	1.65	.8	.85	.75	1.7	1.7	.....	.5	.6
9	1.4	1.2	1.45	.8	1.0	.7	1.5	1.6	1.0	.....	.....
10	1.25	1.2	.....	.8	.9	.9	1.3	1.4	.....	.8	.5
11	1.15	1.35	1.7	.8	.95	1.55	1.0	1.0	.9	.8	.5
12	1.0	1.9	1.95	.8	.8	1.35	1.4	1.2	.6	.....	.....
13	.9	1.75	2.15	.9	.8	1.3	2.1	1.0	.5	.....	.4
14	.9	1.6	2.15	1.3	.75	1.25	1.4	.9	.4	.7	.4
15	.9	1.45	1.7	1.15	.65	1.5	.9	.7	.3	.4	.4
16	.9	1.35	1.5	1.15	.6	1.55	.9	.6	.3	.4	.4
17	.8	1.35	1.35	4.7	.6	1.25	.9	.5	.2	.3	.4
18	.8	4.3	1.25	6.0	.8	.95	1.5	.5	.1	.3	.5
19	.9	4.4	1.2	4.8	.85	.8	4.0	.5	.1	.2	.....
20	.9	3.6	1.2	3.7	.8	.7	2.3	.7	.1	.2	.5
21	1.3	3.1	1.2	2.55	1.0	.55	1.2	.8	.1	.2	.5
22	1.5	3.6	1.2	1.6	1.15	.85	.9	.7	.1	.1	.5
23	1.55	3.0	1.15	1.35	1.15	1.0	.7	.6	.1	.....	.5
24	1.55	5.1	1.1	1.25	1.15	.85	1.7	.4	.1	.1	.5
25	1.55	4.7	1.1	1.15	1.2	1.0	1.7	.4	.0	.1	.4
26	1.5	3.4	1.1	1.15	1.4	1.05	1.2	.4	.0	.1	.5
27	1.35	2.75	1.1	1.1	1.85	.75	.9	.4	.0	.1	.6
28	2.2	4.3	1.0	1.15	1.4	.65	.7	.3	.0	.2	.6
29	3.2	.....	1.0	1.1	1.15	.55	.7	.2	.1	.....	.7
30	2.9	.....	1.0	1.0	.75	.95	.7	.2	.7	.....	.8
31	2.5	.....	1.0	.....	.6	.....	.6	.3	.....	.2	.....

Daily discharge, in second-feet, of Flint River near Woodbury, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	700	1,710	8,450	785	700	410	970	410	410	875	260
2	700	1,340	5,820	700	660	355	1,900	355	475	642	305
3	700	1,460	5,820	700	620	355	3,000	410	545	410	305
4	700	1,970	4,160	700	620	355	3,000	410	972	355	305
5	700	1,580	3,000	700	545	382	3,420	620	1,400	305	305
6	700	1,340	2,180	700	545	510	3,560	1,280	1,180	305	390
7	1,230	1,120	1,710	700	545	620	2,580	970	1,070	305	475
8	1,230	970	1,460	620	660	582	1,520	1,520	928	410	475
9	1,180	970	1,230	620	785	545	1,280	1,400	785	515	442
10	1,020	970	1,380	620	700	700	1,070	1,180	742	620	410
11	925	1,120	1,520	620	740	1,340	785	785	700	620	410
12	785	1,780	1,840	620	620	1,120	1,180	970	475	595	382
13	700	1,580	2,110	700	620	1,070	2,040	785	410	570	355
14	700	1,400	2,110	1,070	582	1,020	1,180	700	355	545	355
15	700	1,230	1,520	925	510	1,280	700	545	305	355	355
16	700	1,120	1,280	925	475	1,340	700	475	305	355	355
17	620	1,120	1,120	5,990	475	1,020	700	410	260	305	355
18	620	5,310	1,020	8,450	620	740	1,280	410	220	305	410
19	700	5,480	970	6,160	660	620	4,800	410	220	260	410
20	700	4,160	970	4,320	620	545	2,310	545	220	260	410
21	1,070	3,420	970	2,650	785	442	970	620	220	260	410
22	1,280	4,160	970	1,400	925	660	700	545	220	220	410
23	1,340	3,280	925	1,120	925	785	545	475	220	220	410
24	1,340	6,700	875	1,020	925	660	1,520	355	220	220	410
25	1,340	5,990	875	925	970	785	1,520	355	190	220	355
26	1,280	3,850	875	925	1,180	830	970	355	190	220	410
27	1,120	2,930	875	875	1,710	582	700	355	190	220	475
28	2,180	5,310	785	925	1,180	510	545	305	190	260	475
29	3,560	.....	785	875	925	442	545	260	220	260	545
30	3,140	.....	785	785	582	740	545	260	545	260	620
31	2,580	.....	785	.....	475	.....	475	305	.....	260	.....

NOTE.—These discharges were obtained from a rating curve which is fairly well defined below 6,500 second-feet. Discharges interpolated for days when gage was not read.

Monthly discharge of Flint River near Woodbury, Ga., for 1910.

[Drainage area, 990 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	3,560	620	1,170	1.18	1.36	A
February	6,700	970	2,620	2.65	2.76	A
March	8,450	785	1,910	1.93	2.22	A
April	8,450	620	1,600	1.62	1.81	A
May	1,710	475	738	.745	.86	A
June	1,340	355	712	.719	.80	A
July	4,800	475	1,520	1.54	1.78	A
August	1,520	260	606	.612	.71	A
September	1,400	190	479	.484	.54	B
October	875	220	372	.376	.43	B
November	620	260	400	.404	.45	B
December	.....	.....	[a] 520	.525	.61	C
The year	8,450	.....	1,040	1.05	14.33	

[a] Estimated by comparison with other Flint River stations.

FLINT RIVER NEAR MONTEZUMA, GA.

This station, which is located at the iron highway bridge about 1 mile west of Montezuma, was established in 1904 by the United States Weather Bureau, by whom gage heights are supplied. Discharge measurements were made by the United States Geological Survey during 1905 and succeeding years.

The flow is not appreciably affected by artificial control.

The chain gage is attached to the upstream side of the bridge from which measurements are made. The datum of the gage has remained the same since the establishment of the station.

The right bank will overflow for a great distance at a stage of about 12 feet. The overflowed portion is largely covered with a dense growth of brush. The left bank is not liable to overflow. The current toward the left bank becomes sluggish at low stages, and at times there is considerable back current near the bank. Conditions of flow are permanent and a fairly good rating has been developed, but the gage heights for 1910 were very uncertain, and hence they have been omitted, together with the daily and monthly discharges.

The following discharge measurement was made by M. R. Hall:

December 13: Width, 190 feet; area of section, 1,480 square feet; gage height, 2.92 feet; discharge, 1,480 second-feet.

FLINT RIVER AT ALBANY, GA.

The station is located at the Dougherty County bridge in Albany, about 700 feet below the Atlantic Coast Line bridge, where the discharge measurements are made. It was originally established by the United States Weather Bureau in 1893 and was maintained with some interruptions until the United States Geological Survey began

to make discharge measurements in 1901. Since that time it has been maintained continuously, all gage heights being furnished by the United States Weather Bureau except those for a portion of 1903.

This station is about 2 miles below the mouth of Muckalee Creek. The operation of the power plant on that creek just above its mouth probably causes some fluctuations in the flow of Flint River at the station.

Fairly accurate measurements can be made at the section at the Atlantic Coast Line bridge, although it is very rough, and train switching in the railroad yard interferes with the work. The section at the Georgia Northern Railway bridge, 1 mile above, at which measurements are sometimes made, is considered better, especially for medium and low stages.

The original staff gage was washed out in 1898. It was again injured in 1902, and on June 18, 1902, a new gage was installed by the United States Weather Bureau at a datum 0.75 foot lower than that of the former gage. The 1902 gage heights, as published by the United States Weather Bureau and the United States Geological Survey, all refer to the new gage datum. The present standard chain gage, installed by the United States Geological Survey April 20, 1904, on this same bridge, has the same datum and reads in conformity with the United States Weather Bureau gage.

The river overflows both banks but only under the approaches to the bridge. The bed is rock and very rough and the current is irregular. Conditions of flow are permanent and a very good rating has been developed.

The following discharge measurement was made at the Georgia Northern Railway bridge, about 1 mile above the station, by M. R. Hall:

December 14: Width, 105 feet; area of section, 1,950 square feet; gage height, 1.10 feet; discharge, 2,760 second-feet.

Daily gage height, in feet, of Flint River at Albany, Ga., for 1910.

[D. W. Brosnan, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	3.5	9.0	1.6	3.1	1.1	3.8	1.8	−0.4	−0.2	−0.6	0.3
2	1.7	4.6	9.5	1.5	2.6	1.0	3.6	1.6	− .4	− .2	− .6	.3
3	1.5	6.0	10.1	1.5	2.3	.8	3.6	1.5	− .2	− .2	− .6	.3
4	1.4	6.6	10.2	1.5	2.0	.5	3.7	1.2	.0	− .2	− .4	.3
5	1.4	6.6	9.8	1.4	1.8	.2	4.1	1.2	.4	− .2	− .2	.2
6	1.4	5.8	9.6	1.4	1.6	.1	4.4	1.1	1.1	.1	− .2	.5
7	1.6	4.9	9.3	1.5	1.5	.5	5.8	1.0	1.3	.3	− .2	.7
8	1.7	4.5	8.8	1.3	1.3	.8	6.8	1.0	1.2	.4	− .1	.7
9	1.7	3.9	9.5	1.3	1.2	.4	7.0	.9	.8	.9	− .1	.6
10	1.5	3.4	10.1	1.2	1.2	.2	6.5	.7	.6	.8	− .1	1.0

Daily gage height, in feet, of Flint River at Albany, Ga., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	1.4	3.2	9.6	1.1	1.2	0.2	5.5	1.2	0.8	0.7	0.2	2.0
12	1.4	3.9	6.2	1.1	1.7	.8	5.0	2.0	1.3	.5	.2	2.1
13	1.6	3.5	4.8	1.1	1.9	1.5	3.9	2.5	1.8	.5	.1	1.8
14	1.8	3.2	4.2	1.1	1.7	2.1	3.6	3.2	2.2	.6	.0	1.4
15	2.0	3.2	3.9	1.1	1.5	3.5	3.2	4.0	2.5	.6	−.1	1.1
16	2.0	3.1	3.9	1.2	1.4	4.7	2.7	3.8	2.5	.6	−.1	1.0
17	1.8	3.1	3.8	2.1	1.1	5.0	2.6	2.8	1.8	.6	−.2	.9
18	1.6	3.6	3.4	2.7	.8	5.2	2.6	2.2	1.0	.4	−.2	1.0
19	1.6	3.6	3.1	3.3	.6	5.0	2.5	1.8	.8	.2	.2	.7
20	1.5	4.0	3.0	5.9	.5	5.0	2.2	1.6	.3	.2	.2	.5
21	2.0	5.5	2.8	7.6	.4	4.0	2.2	1.5	.0	.1	.2	.5
22	2.2	6.9	2.6	11.1	.3	3.1	2.1	1.5	−.1	−.1	.1	1.0
23	2.2	8.7	2.2	12.4	.8	2.6	5.0	1.2	−.2	−.3	.3	1.1
24	2.4	9.3	2.0	12.7	1.2	2.5	5.0	1.0	−.2	−.5	.7	1.2
25	2.5	9.6	2.0	11.1	1.8	2.5	4.6	.4	−.3	−.6	1.1	.9
26	2.6	9.8	1.8	7.5	1.5	2.4	3.7	.1	−.4	−.6	1.4	.7
27	2.6	9.7	1.7	5.5	1.3	2.4	3.2	.0	−.4	−.5	1.3	.6
28	2.6	9.2	1.7	5.1	1.3	2.4	2.8	.0	−.4	−.2	1.0	.5
29	2.8	.....	1.7	4.2	1.2	2.8	2.8	−.1	−.4	−.2	.8	.9
30	3.2	.....	1.6	3.5	1.2	3.3	2.4	−.3	−.3	−.4	.4	1.5
31	3.5	.....	1.6	.....	1.1	.....	2.0	−.4	.....	−.6	.....	1.7

NOTE.—Comparisons indicate that there may be occasional errors in the above record of gage heights.

Daily discharge, in second-feet, of Flint River at Albany, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,380	5,210	11,900	3,200	4,750	2,760	5,560	3,380	1,550	1,700	1,400	2,090
2	3,290	6,480	12,500	3,110	4,190	2,670	5,320	3,200	1,550	1,700	1,400	2,090
3	3,110	8,170	13,300	3,110	3,870	2,500	5,320	3,110	1,700	1,700	1,400	2,090
4	3,020	8,920	13,400	3,110	3,570	2,250	5,440	2,840	1,850	1,700	1,550	2,090
5	3,020	8,920	12,900	3,020	3,380	2,010	5,900	2,840	2,170	1,700	1,700	2,010
6	3,020	7,920	12,700	3,020	3,200	1,930	6,240	2,760	2,760	1,930	1,700	2,250
7	3,200	6,820	12,300	3,110	3,110	2,250	7,920	2,670	2,930	2,090	1,700	2,420
8	3,290	6,360	11,700	2,930	2,930	2,500	9,170	2,670	2,840	2,170	1,780	2,420
9	3,290	5,670	12,500	2,930	2,840	2,170	9,420	2,580	2,500	2,580	1,780	2,330
10	3,110	5,100	13,300	2,840	2,840	2,010	8,800	2,420	2,330	2,500	1,780	2,670
11	3,020	4,860	12,700	2,760	2,840	2,010	7,540	2,840	2,500	2,420	2,010	3,570
12	3,020	5,670	8,420	2,760	3,290	2,500	6,940	3,570	2,930	2,250	2,010	3,670
13	3,200	5,210	6,700	2,760	3,480	3,110	5,670	4,080	3,380	2,250	1,930	3,380
14	3,380	4,860	6,020	2,760	3,290	3,670	5,320	4,860	3,770	2,330	1,850	3,020
15	3,570	4,860	5,670	2,760	3,110	5,210	4,860	5,780	4,080	2,330	1,780	2,760
16	3,570	4,750	5,670	2,840	3,020	6,590	4,300	5,560	4,080	2,330	1,780	2,670
17	3,380	4,750	5,560	3,670	2,760	6,940	4,190	4,410	3,380	2,330	1,700	2,580
18	3,200	5,320	5,100	4,300	2,500	7,180	4,190	3,770	2,670	2,170	1,700	2,670
19	3,200	5,320	4,750	4,980	2,330	6,940	4,080	3,380	2,500	2,010	2,010	2,420
20	3,110	5,780	4,640	8,040	2,250	6,940	3,770	3,200	2,090	2,010	2,010	2,250
21	3,570	7,540	4,410	10,200	2,170	5,780	3,770	3,110	1,850	1,930	2,010	2,250
22	3,770	9,300	4,190	14,600	2,090	4,750	3,670	3,110	1,780	1,780	1,930	2,670
23	3,770	11,500	3,770	16,300	2,500	4,190	6,940	2,840	1,700	1,620	2,090	2,760
24	3,980	12,300	3,570	16,700	2,840	4,080	6,940	2,670	1,700	1,480	2,420	2,840
25	4,080	12,700	3,570	14,600	3,380	4,080	6,480	2,170	1,620	1,400	2,760	2,580
26	4,190	12,900	3,380	10,000	3,110	3,980	5,440	1,930	1,550	1,400	3,020	2,420
27	4,190	12,800	3,290	7,540	2,930	3,980	4,860	1,850	1,550	1,480	2,930	2,330
28	4,190	12,200	3,290	7,060	2,930	3,980	4,410	1,850	1,550	1,700	2,670	2,250
29	4,410	.....	3,290	6,020	2,840	4,410	4,410	1,780	1,550	1,700	2,500	2,580
30	4,860	.....	3,200	5,210	2,840	4,980	3,980	1,620	1,620	1,550	2,170	3,110
31	5,210	.....	3,200	.....	2,760	.....	3,570	1,550	.....	1,400	.....	3,290

NOTE.—These discharges were obtained from a rating curve which is well defined above 2,600 second-feet. Although the daily discharges compare fairly well with those at Woodbury, there are occasional discrepancies, and they should be used with caution.

Monthly discharge of Flint River at Albany, Ga., for 1910.

[Drainage area, 5,000 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	5,210	3,020	3,570	0.714	0.82	B
February	12,900	4,750	7,580	1.52	1.58	A
March	13,400	3,200	7,450	1.49	1.72	A
April	16,700	2,760	5,870	1.17	1.30	A
May	4,750	2,090	3,030	.606	.70	B
June	7,180	1,930	3,940	.788	.88	B
July	9,420	3,570	5,630	1.13	1.30	A
August	5,780	1,550	3,050	.610	.70	B
September	4,080	1,550	2,330	.466	.52	B
October	2,580	1,400	1,920	.384	.44	B
November	3,020	1,400	1,980	.396	.44	B
December	3,670	2,010	2,600	.520	.60	B
The year	16,700	1,400	4,060	.812	11.00	

FLINT RIVER AT BAINBRIDGE, GA.

This station, which is located at the county wagon bridge one-half mile from Bainbridge and about 25 miles above the junction of the Flint with Chattahoochee River, was established in 1904 by the United States Weather Bureau. Discharge measurements at this point were begun by the United States Geological Survey June 11, 1908, the daily gage heights being furnished by the United States Weather Bureau.

The boxed chain gage is attached to the bridge. The datum has not been changed since June 11, 1908, at which time it was adjusted to its original datum. During part of the time prior to this date the chain was wrongly adjusted. Gage heights for 1908 were all corrected before publishing in Water-Supply Paper 242. A good low-water rating has been obtained. No measurements were made in 1910, but it is probable that the 1909 rating will apply for 1910.

Daily gage height, in feet, of Flint River at Bainbridge, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.5	5.5	11.0	5.2	6.2	3.7	4.6	7.3	3.2	2.0	1.9	2.6
2	4.4	6.8	11.1	5.1	6.0	3.9	4.9	7.0	2.8	2.0	1.9	3.0
3	4.3	7.5	11.6	5.0	5.7	4.2	5.2	6.6	2.8	2.1	1.9	3.0
4	4.3	8.0	11.8	4.9	5.5	3.9	5.6	6.0	3.0	2.0	1.9	2.6
5	4.4	8.1	12.0	4.8	5.3	3.5	5.9	5.5	3.4	3.1	1.9	2.9
6	4.2	7.3	11.9	4.8	5.5	3.2	6.0	5.0	3.7	2.9	1.9	2.6
7	4.1	6.5	12.5	4.7	5.3	3.0	5.8	4.7	4.3	2.6	1.9	2.5
8	4.2	6.2	12.8	4.5	5.0	2.8	5.7	4.5	4.9	2.4	1.9	2.7
9	4.2	6.1	13.8	4.6	4.6	2.6	5.5	4.5	5.4	2.5	2.0	2.9
10	4.1	5.9	14.1	4.5	4.6	2.8	6.4	5.0	4.7	2.4	2.2	3.3

Daily gage height, in feet, of Flint River at Bainbridge, Ga., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	4.0	6.1	14.6	4.4	4.7	3.1	7.0	4.7	4.0	2.2	2.3	3.6
12	4.0	6.3	13.4	4.6	4.6	3.2	7.5	4.9	3.6	2.9	2.2	3.9
13	4.2	5.9	11.6	4.4	4.4	3.5	8.0	4.9	3.5	3.0	2.2	3.8
14	4.4	5.5	10.2	4.4	4.2	4.1	7.8	4.6	3.8	3.0	2.2	3.5
15	4.5	5.4	9.3	4.6	4.4	4.5	7.2	4.4	3.4	3.0	2.1	3.4
16	4.4	6.3	7.8	4.5	4.4	4.3	6.8	4.2	3.7	2.9	2.0	3.2
17	4.2	6.4	7.6	4.8	4.2	4.4	6.4	3.9	3.3	2.7	2.0	3.0
18	4.0	6.4	7.4	5.3	4.1	5.6	6.8	3.8	2.8	2.6	2.0	2.9
19	4.1	6.7	7.6	6.2	4.0	6.3	5.8	3.6	2.9	2.4	2.0	2.8
20	4.3	6.5	7.1	6.6	3.8	7.1	5.6	3.6	3.4	2.4	2.2	3.0
21	4.1	6.6	6.5	8.9	3.8	7.6	5.7	3.5	3.7	2.4	2.3	3.2
22	4.0	6.8	6.4	11.1	3.7	8.0	5.9	3.4	4.1	2.3	2.4	3.3
23	4.1	8.2	6.6	12.1	3.6	7.1	6.3	3.4	4.0	2.1	3.0	3.3
24	4.2	9.0	6.3	13.0	3.9	6.4	6.8	3.6	3.7	2.0	3.1	3.7
25	4.4	9.7	6.1	12.9	3.8	5.8	7.4	3.9	3.3	1.9	2.9	3.5
26	4.6	10.4	5.8	13.7	3.9	5.6	7.0	4.5	3.0	1.9	2.6	3.3
27	4.8	10.7	5.7	11.5	4.0	5.3	6.5	4.8	2.7	1.9	2.6	3.2
28	5.0	10.5	5.6	8.0	3.9	5.0	6.4	4.7	2.5	2.0	2.7	3.2
29	5.0	.....	5.4	6.8	3.8	4.8	6.6	4.5	2.4	2.0	2.4	3.4
30	5.2	.....	5.3	6.4	3.6	4.5	6.8	4.1	2.1	2.0	2.4	3.4
31	5.4	.....	5.2	.....	3.5	.....	7.1	3.5	.....	1.9	.....	3.4

Daily discharge, in second-feet, of Flint River at Bainbridge, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,670	5,450	.....	5,210	6,040	4,120	4,740	7,030	3,800	3,120	3,070	3,440
2	4,590	6,570	.....	5,130	5,870	4,250	4,970	6,750	3,560	3,120	3,070	3,680
3	4,520	7,230	.....	5,050	5,610	4,450	5,210	6,390	3,560	3,170	3,070	3,680
4	4,520	7,740	.....	4,970	5,450	4,250	5,530	5,870	3,680	3,120	3,070	3,440
5	4,590	7,840	.....	4,890	5,290	3,990	5,780	5,450	3,930	3,740	3,070	3,620
6	4,450	7,030	.....	4,890	5,450	3,800	5,870	5,050	4,120	3,620	3,070	3,440
7	4,380	6,300	.....	4,820	5,290	3,680	5,700	4,820	4,520	3,440	3,070	3,390
8	4,450	6,040	.....	4,670	5,050	3,560	5,610	4,670	4,970	3,330	3,070	3,500
9	4,450	5,960	.....	4,740	4,740	3,440	5,450	4,670	5,370	3,390	3,120	3,620
10	4,380	5,780	.....	4,670	4,740	3,560	6,220	5,050	4,820	3,330	3,230	3,860
11	4,310	5,960	.....	4,590	4,820	3,740	6,750	4,820	4,310	3,230	3,280	4,050
12	4,310	6,130	.....	4,740	4,740	3,800	7,230	4,970	4,050	3,620	3,230	4,250
13	4,450	5,780	.....	4,590	4,590	3,990	7,740	4,970	3,990	3,680	3,230	4,180
14	4,590	5,450	.....	4,590	4,450	4,380	7,530	4,740	4,180	3,680	3,230	3,990
15	4,670	5,370	9,100	4,740	4,590	4,670	6,940	4,590	3,930	3,680	3,170	3,930
16	4,590	6,130	7,530	4,670	4,590	4,520	6,570	4,450	4,120	3,620	3,120	3,800
17	4,450	6,220	7,330	4,890	4,450	4,590	6,220	4,250	3,860	3,500	3,120	3,680
18	4,310	6,220	7,130	5,290	4,380	5,530	6,570	4,180	3,560	3,440	3,120	3,620
19	4,380	6,480	7,330	6,040	4,310	6,130	5,700	4,050	3,620	3,330	3,120	3,560
20	4,520	6,300	6,840	6,390	4,180	6,840	5,530	4,050	3,930	3,330	3,230	3,680
21	4,380	6,390	6,300	8,680	4,180	7,330	5,610	3,990	4,120	3,330	3,280	3,800
22	4,310	6,570	6,220	.....	4,120	7,740	5,780	3,930	4,380	3,280	3,330	3,860
23	4,380	7,950	6,390	.....	4,050	6,840	6,130	3,930	4,310	3,170	3,680	3,860
24	4,450	8,780	6,130	.....	4,250	6,220	6,570	4,050	4,120	3,120	3,740	4,120
25	4,590	9,540	5,960	.....	4,180	5,700	7,130	4,250	3,860	3,070	3,620	3,990
26	4,740	.....	5,700	.....	4,250	5,530	6,750	4,670	3,680	3,070	3,440	3,860
27	4,890	.....	5,610	.....	4,310	5,290	6,300	4,890	3,500	3,070	3,440	3,800
28	5,050	.....	5,530	7,740	4,250	5,050	6,220	4,820	3,390	3,120	3,500	3,800
29	5,050	.....	5,370	6,570	4,180	4,890	6,390	4,670	3,330	3,120	3,330	3,930
30	5,210	.....	5,290	6,220	4,050	4,670	6,570	4,380	3,170	3,120	3,330	3,930
31	5,370	.....	5,210	.....	3,990	.....	6,840	3,990	.....	3,070	.....	3,930

NOTE.—These discharges were obtained from a rating curve which is well defined between 3,800 and 9,880 second-feet. On days for which no discharge is given it was greater than 9,880 second-feet.

Monthly discharge of Flint River at Bainbridge, Ga., for 1910.

[Drainage area, 7,410 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	5,370	4,310	4,580	0.618	0.71	A
May	6,040	3,990	4,660	.629	.73	A
June	7,740	3,440	4,880	.659	.74	A
July	7,740	4,740	6,200	.837	.96	A
August	7,030	3,930	4,770	.644	.74	A
September	5,370	3,170	3,990	.538	.60	B
October	3,740	3,070	3,320	.448	.52	C
November	3,740	3,070	3,250	.439	.49	C
December	4,250	3,390	3,780	.510	.59	B

NOTE.—Monthly discharges are published only for those months during which the gage heights were 10 feet and under. When sufficient measurements are obtained to develop the high-water portion of the rating curve the tables will be completed and published in a later report.

CHOCTAWHATCHEE RIVER BASIN.

DESCRIPTION.

Choctawhatchee River drains the southeastern part of Alabama and that portion of Florida lying immediately south. The main river rises in Barbour County, Ala., a short distance west of Eufaula, and flows in a southwesterly and southerly direction through Choctawhatchee Bay to the Gulf of Mexico. Pea River, the principal tributary, enters from the west at Geneva, Ala. This branch is the longer of the two above the junction, having its head in Bullock County near Union Springs, Ala.

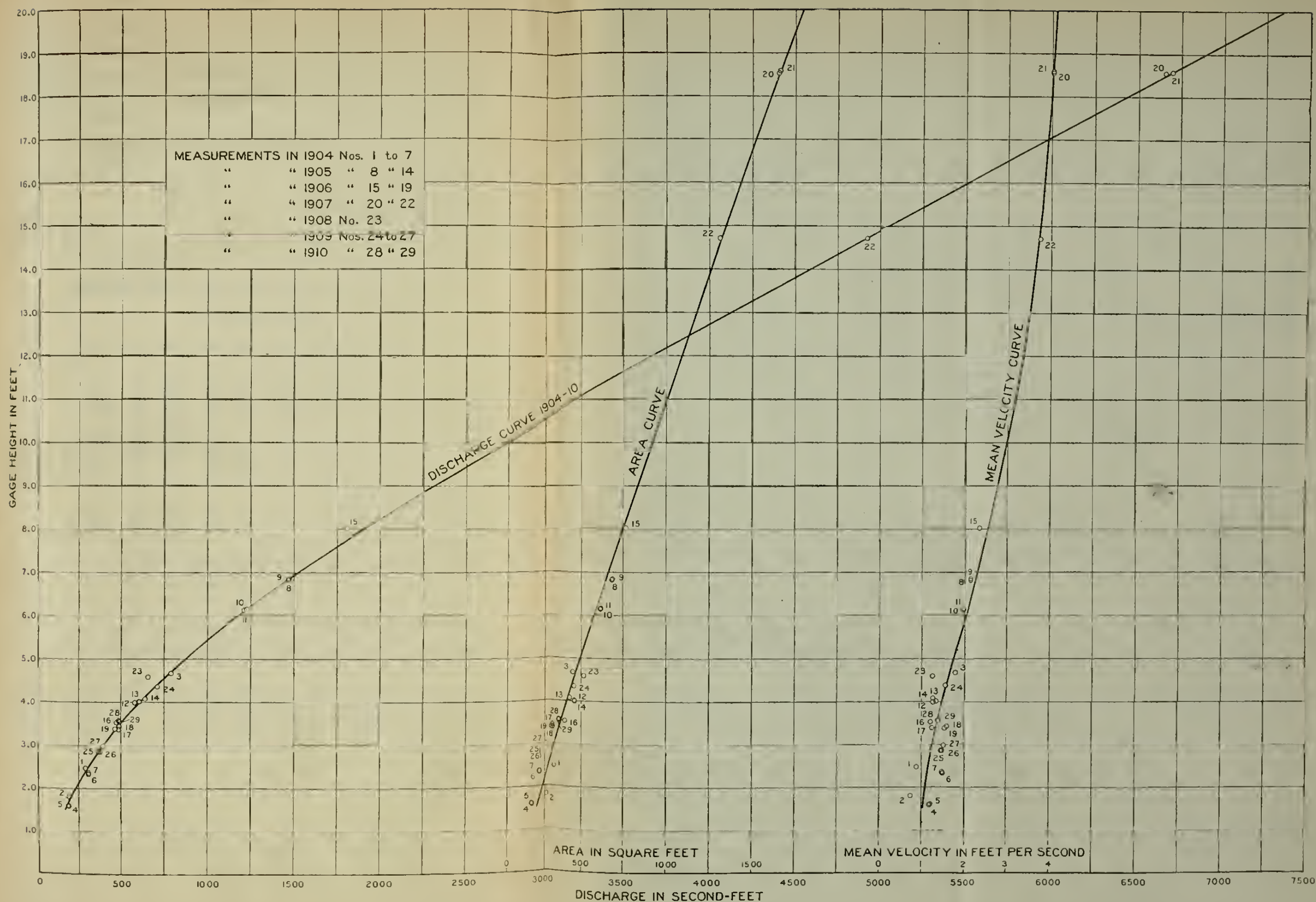
The basin is small, lying entirely in the Coastal Plain. The land is usually well elevated above the streams and is rolling and even hilly at places. The surface is as a rule sandy and is underlain by sandy limestones and clays, which are exposed in many places in the stream beds as solid rocks but are usually soft.

The mean annual rainfall in the area is about 55 inches. The streams are moderately swift, even at low water, and at places the fall is sufficient to make considerable shoals or rapids and offer practicable sites for water-power development.

PEA RIVER AT PERA, ALA.

This station, which is located at the Elton wagon bridge, about one-half mile west of Pera, on the Georgiana & Graceville branch of the Louisville & Nashville Railroad, was established August 27, 1904.

Power plants above the station cause daily fluctuations in the low-water flow. The gage is read twice a day to eliminate or lessen the effect of such fluctuations. Both banks are subject to overflow during extreme high water. Conditions of flow appear to be very nearly permanent and a good rating curve has been developed.



DISCHARGE, AREA, AND MEAN VELOCITY CURVES FOR PEA RIVER AT PERA, ALA.

Discharge measurements are made from the downstream side of the bridge to which the chain gage is attached. The datum of the gage has remained the same since the establishment of the station.

Discharge, area, and mean velocity curves for this station are shown in Plate III.

Discharge measurements of Pea River at Pera, Ala., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Dec. 15	M. R. Hall	70	350	3.56	486
15	do	70	350	3.55	490

Daily gage height, in feet, of Pea River at Pera, Ala., for 1910.

[W. G. Early, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.0	8.9	20.8	5.3	4.7	2.75	5.7	5.4	3.55	2.4	2.4	4.3
2	3.9	8.2	22.3	5.3	4.5	2.7	5.2	5.2	3.4	2.25	2.55	4.1
3	3.85	7.6	22.5	5.0	4.4	2.65	7.2	4.8	3.15	2.15	2.45	3.65
4	3.85	7.6	21.9	4.9	4.2	2.65	9.0	5.1	4.9	2.25	2.45	3.5
5	3.8	7.0	20.8	5.2	4.2	2.85	13.0	6.9	4.2	2.3	2.5	3.35
6	3.95	6.0	17.0	5.4	3.9	3.35	10.2	5.3	3.7	2.45	3.25	3.8
7	7.0	5.5	13.0	5.3	4.1	3.75	8.8	5.8	3.4	3.0	3.8	4.6
8	6.4	5.2	10.9	5.0	3.55	3.75	7.9	5.2	3.4	3.1	3.8	4.8
9	6.0	5.2	9.9	5.0	3.8	3.55	8.3	4.7	3.6	3.2	3.35	4.3
10	5.3	5.0	9.1	4.6	4.6	4.4	8.0	4.2	3.85	3.7	3.0	4.2
11	4.8	5.4	8.8	4.4	4.7	5.6	6.4	3.8	3.8	3.75	2.9	4.0
12	4.7	8.8	10.6	4.4	4.6	6.6	7.8	3.95	4.2	3.05	2.85	3.85
13	4.4	7.6	9.8	5.4	4.3	6.5	5.8	4.2	3.5	2.75	2.7	3.8
14	4.2	7.0	8.8	6.1	4.0	6.1	5.0	5.8	3.25	2.7	2.7	3.7
15	4.2	6.6	8.3	6.4	3.65	5.8	4.4	4.8	3.55	2.55	2.75	3.5
16	4.0	6.2	7.8	6.5	3.45	5.4	4.2	4.0	2.85	2.45	2.65	3.55
17	3.9	6.2	7.3	10.0	3.35	5.5	4.5	3.75	2.8	2.2	2.55	3.5
18	3.85	13.2	7.2	14.2	3.3	5.8	6.2	3.55	3.65	2.3	2.65	4.5
19	3.9	14.5	7.0	15.2	3.15	4.2	6.0	3.35	2.85	2.2	3.35	5.4
20	4.0	11.0	6.7	16.4	3.2	5.0	6.1	3.2	3.05	2.2	4.1	5.2
21	4.6	9.8	6.5	17.0	3.2	4.2	6.0	5.6	2.75	2.2	4.4	4.8
22	5.4	11.6	6.4	12.5	3.35	4.4	5.4	5.9	2.6	2.15	4.2	4.4
23	4.9	11.3	6.3	8.6	3.5	5.4	5.4	4.6	2.55	2.05	3.9	4.2
24	4.6	13.8	6.2	7.4	3.8	5.0	10.8	3.75	2.5	2.0	3.55	5.0
25	4.5	17.5	6.2	6.4	3.9	4.6	16.0	3.5	2.35	2.1	3.4	5.1
26	4.4	14.8	6.2	5.8	3.85	4.4	17.6	3.45	2.25	2.15	3.4	4.8
27	4.3	12.0	6.2	5.6	3.55	4.2	13.6	3.4	2.3	2.05	3.15	4.6
28	5.1	15.6	5.8	5.3	3.3	3.85	9.8	3.15	2.4	2.8	3.55	4.2
29	10.1	.....	5.6	5.2	3.25	3.85	8.0	2.9	2.3	2.6	4.7	4.2
30	9.6	.....	5.6	5.0	3.05	4.2	7.6	2.8	2.55	2.95	5.2	4.4
31	10.4	.....	5.4	.....	2.8	.....	5.6	3.05	.....	2.7	.....	5.8

Daily discharge, in second-feet, of Pea River at Pera, Ala., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	600	2,270	7,720	935	767	353	1,060	965	505	295	295	667
2	578	1,980	8,410	935	715	344	906	906	476	273	318	622
3	567	1,740	8,500	850	691	335	1,590	794	428	259	302	525
4	567	1,740	8,220	822	644	335	2,310	878	822	273	302	495
5	556	1,510	7,720	906	644	372	4,130	1,470	644	280	310	466
6	589	1,160	5,970	965	578	466	2,840	935	535	302	448	556
7	1,510	995	4,130	935	622	546	2,230	1,090	476	400	556	741
8	1,290	906	3,160	850	505	546	1,860	906	476	419	556	794
9	1,160	906	2,710	850	556	505	2,020	767	515	438	466	667
10	935	850	2,350	741	741	691	1,900	644	567	535	400	644
11	794	965	2,230	691	767	1,030	1,290	556	556	546	381	600
12	767	2,230	3,030	691	741	1,360	1,820	589	644	410	372	567
13	691	1,740	2,660	965	667	1,320	1,090	644	495	353	344	556
14	644	1,510	2,230	1,190	600	1,200	850	1,090	448	344	344	535
15	644	1,360	2,020	1,290	525	1,090	691	794	505	318	353	495
16	600	1,220	1,820	1,320	486	965	644	600	372	302	335	505
17	578	1,220	1,620	2,750	466	995	715	546	362	266	318	495
18	567	4,220	1,590	4,680	457	1,090	1,220	505	525	280	335	715
19	578	4,820	1,510	5,140	428	644	1,160	466	372	266	466	965
20	600	3,210	1,400	5,690	438	850	1,190	438	410	266	622	906
21	741	2,660	1,320	5,970	438	644	1,160	1,030	353	266	691	794
22	965	3,490	1,290	3,900	466	691	965	1,120	326	259	644	691
23	822	3,350	1,260	2,140	495	965	965	741	318	246	578	644
24	741	4,500	1,220	1,660	556	850	3,120	546	310	239	505	850
25	715	6,200	1,220	1,290	578	741	5,510	495	288	252	476	878
26	691	4,960	1,220	1,090	567	691	6,250	486	273	259	476	794
27	667	3,670	1,220	1,020	505	644	4,410	476	280	246	428	741
28	878	5,330	1,090	935	457	567	2,660	428	295	362	505	644
29	2,800	.....	1,030	906	448	567	1,900	381	280	326	767	644
30	2,570	.....	1,030	850	410	644	1,740	362	318	390	906	691
31	2,930	.....	965	.....	362	.....	1,030	410	.....	344	.....	1,090

NOTE.—These discharges were obtained from a well-defined rating curve.

Monthly discharge of Pea River at Pera, Ala., for 1910.

[Drainage area, 1,180 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,930	556	946	0.802	0.92	A
February	6,200	850	2,530	2.14	2.23	A
March	8,500	965	2,960	2.51	2.89	A
April	5,970	691	1,770	1.50	1.67	A
May	767	362	559	.474	.55	B
June	1,360	335	735	.623	.70	A
July	6,250	644	1,980	1.68	1.94	A
August	1,470	362	712	.603	.70	A
September	822	273	439	.372	.42	B
October	546	239	323	.274	.32	B
November	906	295	460	.390	.44	B
December	1,090	466	677	.574	.66	A
The year	8,500	239	1,170	.992	13.44	

ESCAMBIA RIVER BASIN.

DESCRIPTION.

Escambia River drains the south-central portion of Alabama and discharges into the Gulf of Mexico through Escambia Bay and Pensacola Bay. Conecuh River joins the Escambia about 5 miles south of the Alabama-Florida State line and is very much the larger of the two. Conecuh River rises in Bullock County, Ala., close to the headwaters of Pea River, in the Choctawhatchee drainage basin, and flows southwestward throughout its course. Pigeon and Patsaliga creeks, both from the west, are the principal tributaries of Conecuh River. The Conecuh and its tributaries are swift streams, and at places on them there are rocky shoals and rapids.

This small basin lies directly west of the Choctawhatchee River basin, to which it is very similar in topographic, geologic, and climatic features.

CONECUH RIVER AT BECK, ALA.

This station, which was established August 24, 1904, is located at Simmons Bridge at Beck, about 12 miles below the mouth of Patsaliga Creek. The nearest railway station is Andalusia, Ala., 8 miles east, on the Central of Georgia and Louisville & Nashville railroads.

The flow is probably not affected by artificial control but at times may be affected by logging operations. Both banks are subject to overflow. The chain gage is attached to the upstream side of the bridge from which the measurements are made. The datum of the gage has remained the same since the establishment of the station. Conditions of flow at this station are practically permanent and a good rating has been developed.

Discharge measurements of Conecuh River at Beck, Ala., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Dec. 16	M. R. Hall	115	324	2.27	456
16	.....do	115	320	2.27	450

Daily gage height, in feet, of Conecuh River at Beck, Ala., for 1910.

[J. F. Hicks, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.6	9.8	3.2	.....	1.9	6.2	4.6	1.8	1.4	1.8	3.1
2	.....	4.9	10.7	3.0	3.3	1.9	3.8	4.4	2.0	.....	1.7	2.8
3	2.7	4.6	10.7	.....	3.1	1.9	.....	4.1	2.1	1.3	1.6	2.5
4	2.6	4.7	9.8	2.9	2.9	1.6	.....	3.8	.....	1.3	1.5	.....
5	2.6	4.3	8.6	2.8	2.8	.....	8.8	5.4	.....	1.8	1.5	2.3
6	2.6	.....	.....	3.5	2.6	3.4	8.8	4.2	1.9	2.3	.....	2.6
7	3.1	3.9	7.6	3.3	2.6	2.4	7.0	.....	1.8	2.2	2.1	2.2
8	2.9	3.7	7.1	3.6	.....	2.2	7.1	3.7	1.7	2.3	2.2	2.5
9	.....	3.6	6.7	3.5	3.2	2.9	6.5	3.0	1.8	.....	2.3	2.6
10	3.2	3.4	6.2	.....	2.9	3.0	.....	2.8	2.1	3.2	2.2	2.7
11	3.1	4.0	6.2	2.9	3.0	4.4	4.4	2.5	.....	2.9	2.1	.....
12	2.9	5.3	5.9	2.8	2.9	.....	9.5	3.0	2.9	2.5	1.9	2.4
13	2.7	.....	.....	5.9	2.8	6.6	5.2	2.7	2.8	2.3	.....	2.4
14	2.7	4.9	5.2	5.2	2.6	6.4	4.3	.....	2.3	1.9	1.8	2.4
15	2.6	4.7	5.0	3.8	.....	7.6	3.6	3.0	2.0	1.9	1.7	2.3
16	.....	4.7	4.7	3.6	2.3	6.8	3.2	3.0	1.9	.....	1.6	2.2
17	2.5	4.4	4.5	.....	2.2	5.6	.....	2.6	1.8	1.7	1.5	2.3
18	2.5	8.7	4.3	10.0	2.1	4.5	3.2	2.5	.....	1.7	1.6	.....
19	2.5	7.5	4.1	10.5	2.1	.....	4.2	2.3	1.5	1.6	2.3	3.3
20	2.4	.....	.....	11.6	2.0	3.3	4.7	2.2	1.5	1.6	.....	2.5
21	3.4	6.4	3.8	15.8	2.4	2.9	4.3	.....	1.5	1.5	2.4	2.7
22	3.0	.....	3.8	16.0	.....	5.9	4.0	3.4	1.4	1.5	2.9	2.7
23	.....	10.2	3.7	14.2	3.2	4.6	3.7	2.8	1.4	.....	3.1	2.7
24	3.3	13.7	3.6	.....	4.1	6.5	.....	2.3	1.5	1.4	.....	3.5
25	3.2	10.8	3.6	6.7	3.5	5.6	10.2	2.3	.....	1.4	2.5	.....
26	3.0	10.1	3.6	6.2	3.4	.....	10.9	2.2	1.4	1.4	2.3	3.2
27	2.9	.....	.....	5.0	3.1	4.0	11.7	2.1	1.4	1.4	.....	3.2
28	5.6	8.8	3.7	4.3	2.8	3.3	13.6	.....	1.4	2.2	3.5	3.0
29	7.7	.....	3.6	3.9	.....	3.3	10.6	1.9	1.4	1.7	2.8	2.4
30	.....	.....	3.5	3.7	.....	3.5	6.9	1.8	1.4	.....	2.9	4.8
31	6.0	.....	3.3	.....	2.1	.....	.....	1.7	.....	1.8	.....	3.8

Daily discharge, in second-feet, of Conecuh River at Beck, Ala., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	585	1,830	4,140	757	875	373	2,160	1,350	352	278	352	720
2	585	1,490	4,640	684	795	373	996	1,260	395	270	332	617
3	585	1,350	4,640	667	720	373	1,860	1,120	418	262	313	524
4	554	1,400	4,140	650	650	313	2,720	996	403	262	295	496
5	554	1,210	3,470	617	617	574	3,580	1,730	388	352	295	469
6	554	1,120	3,190	874	554	834	3,580	1,170	373	469	356	554
7	720	1,040	2,910	795	554	496	2,590	1,060	352	443	418	443
8	650	955	2,640	914	656	443	2,640	955	332	469	443	524
9	704	914	2,430	874	757	650	2,320	684	352	613	469	554
10	757	834	2,160	762	650	684	1,790	617	418	757	443	585
11	720	1,080	2,160	650	684	1,260	1,260	524	534	650	418	540
12	650	1,680	2,000	617	650	1,820	3,970	684	650	524	373	496
13	585	1,580	1,820	2,000	617	2,370	1,640	585	617	469	362	496
14	585	1,490	1,640	1,640	554	2,270	1,210	634	469	373	352	496
15	554	1,400	1,540	996	512	2,910	914	684	395	373	332	469
16	539	1,400	1,400	914	469	2,480	757	684	373	352	313	443
17	524	1,260	1,300	2,580	443	1,830	757	554	352	332	295	469
18	524	3,520	1,210	4,250	418	1,300	757	524	324	332	313	632
19	524	2,860	1,120	4,530	418	1,050	1,170	469	295	313	469	795
20	496	2,560	1,060	5,150	395	795	1,400	443	295	313	482	524
21	834	2,270	996	7,550	496	650	1,210	638	295	295	496	585
22	684	3,320	996	7,660	626	2,000	1,080	834	278	295	650	585
23	740	4,360	955	6,630	757	1,350	955	617	278	286	720	585
24	795	6,350	914	4,530	1,120	2,320	2,660	469	295	278	622	874
25	757	4,700	914	2,430	874	1,830	4,360	469	286	278	524	816
26	684	4,310	914	2,160	834	1,460	4,750	443	278	278	469	757
27	650	3,840	934	1,540	720	1,080	5,210	418	278	278	672	757
28	1,830	3,580	955	1,210	617	795	6,290	396	278	443	874	684
29	2,970	.....	914	1,040	551	795	4,590	373	278	332	617	617
30	2,510	.....	874	955	484	874	2,540	352	278	342	650	1,260
31	2,050	.....	795	.....	418	.....	1,940	332	.....	352	.....	996

NOTE.—These discharges were obtained from a rating curve which is fairly well defined below 7,000 second-feet. Discharges interpolated for days when gage was not read.

Monthly discharge of Conecuh River at Beck, Ala., for 1910.

[Drainage area, 1,290 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,970	496	853	0.661	0.76	B
February	6,350	834	2,280	1.77	1.84	A
March	4,640	795	1,930	1.50	1.73	A
April	7,660	617	2,220	1.72	1.92	A
May	1,120	395	629	.488	.56	B
June	2,910	313	1,210	.938	1.05	B
July	6,290	757	2,380	1.84	2.12	A
August	1,730	332	712	.552	.64	B
September	650	278	364	.282	.31	B
October	757	262	376	.291	.34	B
November	874	295	457	.354	.40	B
December	1,260	443	625	.484	.56	B
The year	7,660	262	1,160	.899	12.23	

MOBILE RIVER BASIN.

DESCRIPTION.

The waters of the Mobile basin enter the Gulf of Mexico through Mobile River, which is formed by the union of Alabama and Tombigbee rivers at a point near the coast. The system drains a triangular basin almost 300 miles wide near the headwaters in Georgia, Alabama, and Mississippi, having a total area of more than 40,000 square miles, and including about two-thirds of the State of Alabama and large areas in Georgia and Mississippi.

The main stream of the Alabama River branch, which has a somewhat greater drainage area than the Tombigbee branch, has many names. Beginning at the headwaters it is Cartecay River, which with Ellijay River makes the Coosawattee. This, with Conasauga River, forms Oostanaula River and at Rome, Ga., the Oostanaula and the Etowah unite to form Coosa River. Six miles above Montgomery, Ala., Tallapoosa River joins the Coosa and forms Alabama River. Hillabee Creek flows into Tallapoosa River just above Sturdevant. Talladega and Choccolocco creeks are tributaries of the Coosa.

The Coosa heads in the Appalachian Mountains of middle-north Georgia, mostly in the southwestern extremity of the Blue Ridge system. Its headwater streams, which include the Coosawattee, the Etowah, and the extreme upper portion of the Conasauga, rising at elevations of 2,000 to 3,000 feet above sea level, descend rapidly over hard beds of schistose rocks to the limestones and dolomites beginning in the northwestern part of Georgia and comprising a large portion of the northern and northeastern sections of the State of Alabama. These streams drain large areas of forested lands, much of which is too steep for ordinary agricultural use. About 30

miles above Wetumpka, Ala., the Coosa again enters an area of granitic rocks of the Piedmont Plateau, from which it passes with considerable drop to the Coastal Plain at Wetumpka.

The Alabama River proper is entirely in the Coastal Plain. It flows first through an extensive bed of pure, soft limestone and afterward through the newer limestones and sandstones extending to the coast.

Tallapoosa River is entirely in the Piedmont Plateau above Tallassee, Ala., where its greatest falls occur as it passes to the Coastal Plain.

Cahaba River heads in the coal measures of central Alabama and flows southward to Alabama River, about 10 miles below Selma, Ala.

Tombigbee River rises in the northeastern part of Mississippi and enters Alabama in Pickens County. Its principal tributary is the Black Warrior, which is formed by the junction of Mulberry Fork and Sipsey Fork. Locust Fork enters the Black Warrior some distance below the junction.

The main stream of the Tombigbee system, which is entirely in the Coastal Plain, heads very close to Tennessee River at the northeast corner of Mississippi, where it drains a wide area of flat country lower in elevation than the upper portion of the Black Warrior River basin, and much lower than the corresponding portion of the Alabama River basin. The Tombigbee, from its headwaters, drains a region whose rocks correspond, in general, with those along the Alabama below Montgomery. The Black Warrior River basin drains the coal measures of north-central Alabama, in which are found a large part of the extensive coal and iron deposits of the State.

The Mobile basin contains abundant and valuable deposits of such minerals as coal, iron, manganese, bauxite, barytes, marbles, and other limestones, cement materials, and clays.

The mean annual rainfall in this drainage area is about 50 inches. The basin contains a number of good reservoir sites, especially on Etowah, Coosawattee, and Conasauga rivers. Some of these have recently been surveyed by the Army engineers.

Coosa and Tallapoosa rivers and their tributaries are important water-power streams and offer many exceptionally good locations for development.

The following special reports contain information regarding the hydrography of the Mobile River drainage basin:

Water powers of Alabama, with an appendix on stream measurements in Mississippi, by B. M. Hall: Water-Supply Paper U. S. Geol. Survey No. 107. Contains data on stream flow, river surveys, and water power collected in Alabama prior to 1904.

Water resources of Georgia, by B. M. and M. R. Hall: Water-Supply Paper U. S. Geol. Survey No. 197. Contains data on stream flow, water power, and river surveys collected in the Mobile basin in Georgia prior to 1906.

Sheets showing the profile of Tallapoosa River between Tallapoosa, Ga., and Matilda, Ala., may be obtained by applying to the Director, United States Geological Survey, Washington, D. C.

OOSTANAULA RIVER AT RESACA, GA.

This station, which is located at the bridge of the Western & Atlantic Railroad in the town of Resaca, 800 feet south of the depot, is 3 miles below the junction of Conasauga and Coosawattee rivers and 1 mile above the mouth of Camp Creek. The station was originally established by the United States Weather Bureau in 1891. In 1896 discharge measurements were made by the United States Geological Survey, and until the end of 1898 half-year gage-height records were kept, completing the Weather Bureau's half-year records. From 1899 to 1904 only partial records of gage height were obtained. At present the gage heights are furnished by the United States Weather Bureau.

Except on the smaller tributaries there are very few milldams, and these have little or no effect on the flow at the station.

The left bank is low and overflows during high water for 480 feet. Discharge measurements are usually made from the downstream side of the bridge but at times are made from a boat at the ferry, about 200 feet above, where the section is somewhat better.

The gage is a heavy vertical staff attached to the downstream side of the pier in the middle of the river. The datum of the gage has not been changed since the establishment of the station. Conditions of flow at this station are practically permanent and a good rating has been developed for low and medium stages.

Discharge measurements of Oostanaula River at Resaca, Ga., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 14	M. R. Hall	146	910	4.20	1,840
May 28	do	186	2,070	10.30	6,960
28	do	185	1,850	9.15	6,060

Daily gage height, in feet, of Oostanaula River at Resaca, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.4	3.4	8.2	3.0	3.8	5.2	8.2	4.2	9.3	5.2	2.2	2.6
2	3.0	3.4	10.4	2.8	3.6	5.0	8.2	4.0	10.0	3.4	2.2	2.4
3	3.0	3.2	8.8	2.6	3.4	5.0	11.0	3.8	8.3	3.0	2.4	2.4
4	2.8	3.4	7.4	2.6	3.2	5.0	12.6	3.8	5.3	3.0	2.4	2.6
5	2.8	3.6	6.6	2.4	3.0	5.2	10.2	7.2	4.3	3.0	2.5	3.6
6	2.8	3.6	5.5	2.4	3.2	11.8	9.6	6.0	4.0	3.0	2.6	13.6
7	5.4	3.6	5.2	2.4	3.4	10.6	10.2	7.0	3.8	3.0	2.6	11.6
8	7.2	3.4	4.8	2.4	5.6	8.0	9.2	6.5	3.8	3.0	2.5	8.2
9	6.8	3.4	4.6	2.4	13.0	6.0	8.4	5.8	3.8	3.4	2.5	5.0
10	4.6	3.2	4.4	2.4	11.4	5.8	9.0	4.8	3.8	3.2	2.4	4.2
11	4.0	3.3	5.6	2.3	8.6	9.8	8.6	4.4	3.6	3.2	2.4	4.0
12	3.8	6.0	5.4	2.3	6.2	10.0	8.8	4.0	3.2	3.0	2.3	4.0
13	3.6	6.2	4.8	2.4	5.4	8.6	8.6	4.0	2.8	3.0	2.3	3.8
14	3.6	5.0	4.4	2.4	5.2	7.6	8.2	3.8	2.8	2.8	2.3	3.4
15	3.4	4.2	4.2	2.4	4.8	6.8	7.5	3.8	2.8	2.8	2.3	3.0
16	3.4	3.8	3.6	3.8	4.6	6.0	7.0	3.6	2.8	2.6	2.2	2.8
17	3.2	4.8	3.4	10.8	5.6	6.6	6.4	3.4	2.8	2.6	2.2	2.6
18	2.8	12.8	3.4	11.6	7.0	6.4	5.8	3.4	2.8	2.6	2.2	2.5
19	3.6	13.2	3.4	7.4	7.4	5.2	5.6	3.4	2.8	2.4	2.2	2.5
20	4.0	10.0	3.4	5.2	10.4	5.2	5.4	3.4	2.8	2.4	2.2	2.4
21	4.8	6.4	3.8	4.0	18.0	6.8	5.0	3.4	2.8	2.4	2.2	2.4
22	5.4	5.4	3.6	4.0	19.8	6.0	5.2	3.6	2.8	2.2	2.2	2.4
23	5.0	5.2	3.4	4.0	18.2	5.6	5.0	3.8	2.8	2.2	2.2	2.4
24	5.0	5.2	3.4	4.0	14.0	5.4	4.8	3.8	2.6	2.0	2.2	3.0
25	4.8	5.0	3.3	4.0	15.6	5.6	4.7	3.8	2.6	2.0	2.2	3.4
26	4.8	4.7	3.3	4.2	14.2	5.8	4.5	3.8	2.6	2.0	2.2	3.2
27	4.6	4.6	3.3	4.2	13.8	5.4	4.7	3.8	2.6	2.0	2.2	3.0
28	4.6	4.6	3.2	4.6	11.0	5.4	6.0	3.8	2.6	2.4	2.8	3.0
29	4.7	.....	3.2	4.2	6.6	7.6	4.7	3.8	2.8	2.8	3.0	3.0
30	4.4	.....	3.1	4.0	6.2	5.8	4.2	3.8	4.6	2.6	3.0	3.6
31	4.2	.....	3.1	.....	5.5	.....	4.2	3.8	.....	2.4	.....	4.0

Daily discharge, in second-feet, of Oostanaula River at Resaca, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,380	1,380	5,160	1,140	1,630	2,650	5,160	1,900	6,140	2,650	726	920
2	1,140	1,380	7,160	1,030	1,500	2,500	5,160	1,760	6,780	1,380	726	820
3	1,140	1,260	5,690	920	1,380	2,500	7,730	1,630	5,240	1,140	820	820
4	1,030	1,380	4,450	920	1,260	2,500	9,270	1,630	2,730	1,140	820	920
5	1,030	1,500	3,770	820	1,140	2,650	6,970	4,280	1,970	1,140	870	1,500
6	1,030	1,500	2,880	820	1,260	8,500	6,410	3,270	1,760	1,140	920	10,200
7	2,800	1,500	2,650	820	1,380	7,350	6,970	4,110	1,630	1,140	920	8,310
8	4,280	1,380	2,350	820	2,960	4,980	6,050	3,680	1,630	1,140	870	5,160
9	3,940	1,380	2,200	820	9,660	3,270	5,330	3,110	1,630	1,380	870	2,500
10	2,200	1,260	2,040	820	8,110	3,110	5,870	2,350	1,630	1,260	820	1,900
11	1,760	1,320	2,960	772	5,510	6,600	5,510	2,040	1,500	1,260	820	1,760
12	1,630	3,270	2,800	772	3,430	6,780	5,690	1,760	1,260	1,140	772	1,760
13	1,500	3,430	2,350	820	2,800	5,510	5,510	1,760	1,030	1,140	772	1,630
14	1,500	2,500	2,040	820	2,650	4,630	5,160	1,630	1,030	1,030	772	1,380
15	1,380	1,900	1,900	820	2,350	3,940	4,540	1,630	1,030	1,030	772	1,140
16	1,380	1,630	1,500	1,630	2,200	3,270	4,110	1,500	1,030	920	726	1,030
17	1,260	2,350	1,380	7,540	2,960	3,770	3,600	1,380	1,030	920	726	920
18	1,030	9,460	1,380	8,310	4,110	3,660	3,110	1,380	1,030	920	726	870
19	1,500	9,860	1,380	4,450	4,450	2,650	2,960	1,380	1,030	820	726	870
20	1,760	6,780	1,380	2,650	7,160	2,650	2,800	1,380	1,030	820	726	820
21	2,350	3,600	1,630	1,760	14,600	3,940	2,500	1,380	1,030	820	726	820
22	2,800	2,800	1,500	1,760	16,400	3,270	2,650	1,500	1,030	726	726	820
23	2,500	2,650	1,380	1,760	14,800	2,960	2,500	1,630	1,030	726	726	820
24	2,500	2,650	1,380	1,760	10,600	2,800	2,350	1,630	920	640	726	1,140
25	2,350	2,500	1,320	1,760	12,200	2,960	2,270	1,630	920	640	726	1,380
26	2,350	2,270	1,320	1,900	10,800	3,110	2,120	1,630	920	640	726	1,260
27	2,200	2,200	1,320	1,900	10,400	2,800	2,270	1,630	920	640	726	1,140
28	2,200	2,200	1,320	2,200	7,730	2,800	3,270	1,630	920	820	1,030	1,140
29	2,270	.....	1,320	1,900	3,770	4,630	2,270	1,630	1,030	1,030	1,140	1,140
30	2,040	.....	1,200	1,760	3,430	3,110	1,900	1,630	2,200	920	1,140	1,500
31	1,900	.....	1,200	.....	2,880	.....	1,900	1,630	.....	820	.....	1,760

NOTE.—These discharges were obtained from a rating curve which is well defined below 7,700 second-feet.

Monthly discharge of Oostanaula River at Resaca, Ga., for 1910.

[Drainage area, 1,610 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	4,280	1,030	1,940	1.20	1.38	A
February	9,860	1,260	2,760	1.71	1.78	A
March	7,160	1,200	2,330	1.45	1.67	A
April	8,310	772	1,870	1.16	1.29	A
May	16,400	1,140	5,660	3.52	4.06	A
June	8,500	2,500	3,860	2.40	2.68	A
July	9,270	1,900	4,320	2.68	3.09	A
August	4,280	1,380	1,970	1.22	1.41	A
September	6,780	920	1,770	1.10	1.23	A
October	2,650	640	1,030	.640	.74	A
November	1,140	726	810	.503	.56	A
December	10,200	820	1,880	1.17	1.35	A
The year	16,400	640	2,520	1.57	21.24	

COOSA RIVER AT RIVERSIDE, ALA.

This station, which is located at the Southern Railway bridge in the village of Riverside, Ala., was established September 25, 1896, and has been maintained continuously since that date.

The station is 1 mile above Blue Eye and about 7 miles above Choccolocco Creek. The flow is not noticeably affected by artificial control at the comparatively few dams above. Four navigation locks have been constructed above, the nearest of which is Lock 4, about 4 miles above.

The standard chain gage is attached to the right-bank end of the downstream side of the railroad bridge from which discharge measurements are made. The original wire gage was located on the downstream side of the bridge near the middle of the river. The gage datum has not been changed since the station was established.

For a part of the width the current is broken by a ledge above. Both banks are high and do not overflow, and the bed of the stream is rocky and permanent. A good rating curve has been developed.

Discharge measurements of Coosa River at Riverside, Ala., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 28	F. P. Thomas	557	4,820	3.68	9,460
29	do	556	4,740	3.49	8,920

Daily gage height, in feet, of Coosa River at Riverside, Ala., for 1910.

[A. J. Morris, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	3.5	6.1	2.2	2.4	4.0	6.9	2.8	2.2	1.3	1 0	1.25
2	2.0	3.3	7.3	2.2	2.4	3.5	8.5	2.8	2.5	1.3	1.0	1.3
3	2.0	3.0	8.8	2.2	2.4	3.1	10.3	2.8	3.0	1.4	1.0	1.3
4	2.0	2.8	8.7	2.2	2.3	2.9	11.9	2.8	3.6	1.4	1.0	1.25
5	2.2	2.7	7.5	2.1	2.3	2.9	11.3	2.7	4.0	1.5	1.0	1.4
6	2.2	2.7	6.3	2.1	2.2	3.0	10.6	3.0	4.2	1.8	1.0	1.8
7	3.6	2.7	5.5	2.0	2.2	4.3	10.3	4.1	4.5	1.8	1.1	3.1
8	5.9	2.6	4.7	1.9	2.2	5.8	10.9	5.0	4.0	2.1	1.1	5.7
9	5.8	2.5	4.2	1.9	2.3	5.9	10.7	5.0	3.2	2.1	1.1	6.3
10	5.4	2.4	4.0	1.9	2.8	6.0	9.3	4.5	2.9	2.0	1.1	5.3
11	4.7	2.4	4.7	1.9	3.6	6.7	8.5	3.7	2.5	2.0	1.1	4.1
12	4.0	2.3	5.3	2.0	5.6	6.5	8.4	3.0	2.3	1.8	1.1	3.0
13	3.3	3.0	5.0	2.0	6.0	6.4	7.8	2.6	2.0	1.7	1.1	2.2
14	3.0	3.4	4.7	2.0	4.5	6.4	7.5	2.5	1.7	1.6	1.1	2.0
15	2.7	3.4	4.1	2.1	3.8	6.2	6.8	2.5	1.6	1.6	1.1	1.8
16	2.9	3.3	3.8	2.2	2.8	6.0	5.7	2.5	1.6	1.5	1.1	1.7
17	3.0	3.3	3.5	3.5	2.5	4.8	6.0	2.4	1.5	1.5	1.1	1.6
18	2.8	7.1	3.2	5.0	3.5	4.0	5.5	2.3	1.4	1.4	1.1	1.6
19	2.8	8.3	3.0	4.2	6.0	3.8	4.2	2.2	1.4	1.4	1.1	1.5
20	3.0	9.9	3.0	4.0	8.5	3.8	3.7	2.1	1.4	1.35	1.1	1.5
21	3.1	9.7	2.9	3.5	10.2	3.8	3.6	2.2	1.35	1.3	1.1	1.5
22	3.5	8.2	2.8	3.1	11.3	4.0	3.6	2.2	1.3	1.3	1.1	1.5
23	3.4	6.7	2.7	3.0	12.1	3.8	3.5	2.1	1.3	1.2	1.1	1.6
24	3.3	5.7	2.7	2.8	12.8	3.4	3.4	2.0	1.3	1.2	1.1	1.6
25	3.3	5.3	2.5	2.7	12.2	3.3	3.4	2.0	1.3	1.2	1.1	1.5
26	3.5	4.9	2.5	2.6	11.9	3.0	3.3	2.0	1.3	1.1	1.1	1.4
27	3.5	4.6	2.5	2.5	11.0	3.2	3.2	1.9	1.2	1.1	1.1	1.4
28	3.7	4.4	2.3	2.5	10.0	4.5	3.0	1.9	1.2	1.1	1.1	1.6
29	3.7	.....	2.3	2.4	8.4	5.0	3.0	2.0	1.2	1.1	1.15	1.7
30	3.6	.....	2.3	2.4	6.9	7.0	3.0	2.0	1.3	1.1	1.2	1.9
31	3.5	.....	2.3	.....	5.5	.....	2.9	2.1	.....	1.1	.....	1.9

Daily discharge, in second-feet, of Coosa River at Riverside, Ala., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,380	8,700	17,900	4,900	5,420	10,300	21,000	6,540	4,900	2,810	2,260	2,720
2	4,380	8,060	22,700	4,900	5,420	8,700	27,700	6,540	5,700	2,810	2,260	2,810
3	4,380	7,140	29,000	4,900	5,420	7,440	35,300	6,540	7,140	3,010	2,260	2,810
4	4,380	6,540	28,500	4,900	5,160	6,840	42,200	6,540	9,020	3,010	2,260	2,720
5	4,900	6,250	23,500	4,640	5,160	6,840	39,600	6,250	10,300	3,220	2,260	3,010
6	4,900	6,250	18,700	4,640	4,900	7,140	36,600	7,140	11,000	3,890	2,260	3,890
7	9,020	6,250	15,600	4,380	4,900	11,300	35,300	10,600	12,000	3,890	2,440	7,440
8	13,800	5,970	12,700	4,130	4,900	16,800	37,900	13,800	10,300	4,640	2,440	16,400
9	16,800	5,700	11,000	4,130	5,160	17,100	37,000	13,800	7,750	4,640	2,440	18,700
10	15,300	5,420	10,300	4,130	6,540	17,500	31,100	12,000	6,840	4,380	2,440	14,900
11	12,700	5,420	12,700	4,130	9,020	20,200	27,700	9,340	5,700	4,380	2,440	10,600
12	10,300	5,160	14,900	4,380	16,000	19,400	27,300	7,140	5,160	3,890	2,440	7,140
13	8,060	7,140	13,800	4,380	17,500	19,000	24,800	5,970	4,380	3,660	2,440	4,900
14	7,140	8,380	12,700	4,380	12,000	19,000	23,500	5,700	3,660	3,430	2,440	4,380
15	6,250	8,380	10,600	4,640	9,660	18,300	20,600	5,700	3,430	3,430	2,440	3,890
16	6,840	8,060	9,660	4,900	6,540	17,500	16,400	5,700	3,430	3,220	2,446	3,660
17	7,140	8,060	8,700	8,700	5,700	13,100	17,500	5,420	3,220	3,220	2,440	3,430
18	6,540	21,800	7,750	13,800	8,700	10,300	15,600	5,160	3,010	3,010	2,440	3,430
19	6,540	26,900	7,140	11,000	17,500	9,660	11,000	4,900	3,010	3,010	2,440	3,220
20	7,140	33,600	7,140	10,300	27,700	9,660	9,340	4,640	3,010	2,910	2,440	3,220
21	7,440	32,800	6,840	8,700	34,900	9,660	9,020	4,900	2,910	2,810	2,440	3,220
22	8,700	26,400	6,540	7,440	39,600	10,300	9,020	4,900	2,810	2,810	2,440	3,220
23	8,380	20,200	6,250	7,140	43,000	9,660	8,700	4,640	2,810	2,620	2,440	3,430
24	8,060	16,400	6,250	6,540	46,000	8,380	8,380	4,380	2,810	2,620	2,440	3,430
25	8,060	14,900	5,700	6,250	43,400	8,060	8,380	4,380	2,810	2,620	2,440	3,220
26	8,700	13,400	5,700	5,970	42,200	7,140	8,060	4,380	2,810	2,440	2,440	3,010
27	8,700	12,400	5,700	5,700	38,300	7,750	7,750	4,130	2,620	2,440	2,440	3,010
28	9,340	11,700	5,160	5,700	34,100	12,000	7,140	4,130	2,620	2,440	2,440	3,430
29	9,340	.....	5,160	5,420	27,300	13,800	7,140	4,380	2,620	2,440	2,530	3,660
30	9,020	.....	5,160	5,420	21,000	21,400	7,140	4,380	2,810	2,440	2,620	4,130
31	8,700	.....	5,160	.....	15,600	.....	6,840	4,640	.....	2,440	.....	4,130

NOTE.—These discharges were obtained from a well-defined rating curve.

Monthly discharge of Coosa River at Riverside, Ala., for 1910.

[Drainage area, 7,060 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	16,800	4,380	8,240	1.17	1.35	A
February	33,600	5,160	12,400	1.76	1.83	A
March	29,000	5,160	11,600	1.64	1.89	A
April	13,800	4,130	6,020	.853	.95	A
May	46,000	4,900	18,300	2.59	2.99	A
June	21,400	6,840	12,500	1.77	1.98	A
July	42,200	6,840	20,200	2.86	3.30	A
August	13,800	4,130	6,410	.908	1.05	A
September	12,000	2,620	5,020	.711	.79	A
October	4,640	2,440	3,180	.450	.52	A
November	2,620	2,260	2,410	.341	.38	A
December	18,700	2,720	5,200	.737	.85	A
The year	46,000	2,260	9,290	1.32	17.88	

ALABAMA RIVER AT SELMA, ALA.

This station is located at the iron highway bridge in Selma, Ala. It was originally established by the United States Army Engineer Corps but is now maintained by the United States Weather Bureau. Discharge measurements were begun by the United States Geological Survey in 1900, and the station ratings were applied to the gage heights for 1899.

The United States Weather Bureau gage formerly used was in two sections—the low-water portion, reading from −3 to +5.1 feet, being fastened to the lower side of the cofferdam on the second pier, and the upper portion, reading from 5.1 to 55 feet, being fastened to the draw pier. The present gage, which is of the standard chain type, is the property of the United States Geological Survey and was installed March 22, 1906, on the downstream side of the highway bridge from which the measurements are made.

The datum of the gage has remained the same since the establishment of the station, but the bad condition and probable change in the low-water section of the staff gage has introduced some uncertainty in the low-water gage heights prior to the establishment of the present chain gage. The channel is deep and swift and is difficult to sound even at ordinary stages. Both banks are high, but the left is subject to overflow at extreme high water.

Conditions of flow are somewhat changeable, but a fairly good rating has been developed for recent years. Gage heights are available prior to 1899, but owing to changing conditions of flow the ratings for later years are not applicable.

Daily gage height, in feet, of Alabama River at Selma, Ala., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.2	10.2	14.5	3.7	3.1	12.0	11.2	4.9	1.1	−0.2	−0.5	0.1
2	4.4	9.0	18.4	3.5	3.0	9.3	14.9	4.8	1.1	− .1	− .5	.2
3	3.7	7.7	21.6	3.4	3.0	7.1	20.4	4.5	1.3	.8	− .4	.4
4	3.2	7.0	23.1	3.3	2.9	5.5	25.4	4.0	1.4	.8	− .4	.2
5	2.9	7.6	22.8	3.1	2.7	4.4	29.0	3.9	2.0	.3	− .3	.3
6	2.6	8.3	21.1	3.3	2.6	4.2	31.0	3.6	4.6	.3	− .2	.7
7	2.6	7.2	18.2	3.4	2.5	3.9	31.5	4.2	7.7	1.0	− .1	1.8
8	3.2	6.0	15.0	3.5	2.3	4.0	30.0	5.9	7.2	1.4	.0	4.2
9	6.0	5.3	12.4	3.4	2.2	5.7	28.0	8.8	5.5	1.4	.0	4.9
10	8.9	4.8	10.6	3.2	2.1	7.7	25.7	11.6	3.9	2.1	− .1	5.3
11	9.7	4.3	9.6	2.9	2.2	10.2	23.1	10.9	2.8	2.9	.0	7.7
12	9.2	5.1	8.9	2.7	2.7	11.5	20.5	9.1	2.6	3.1	− .1	7.9
13	8.1	6.9	8.9	2.9	4.2	12.7	18.0	8.1	2.4	2.3	− .2	6.5
14	6.8	8.7	9.7	3.1	6.9	13.1	16.6	9.0	2.2	1.9	− .2	4.9
15	5.6	8.5	9.8	3.7	7.1	12.1	14.6	9.4	2.0	1.9	− .3	3.5
16	4.7	7.8	9.1	4.0	5.9	11.2	12.3	7.0	1.9	1.7	− .3	2.4
17	4.1	7.2	8.1	5.5	4.4	11.1	10.5	5.0	1.5	1.3	− .3	1.7
18	3.7	8.5	7.3	7.5	3.4	10.6	9.8	3.9	1.0	.8	− .3	1.5
19	3.4	13.7	6.6	12.3	3.0	9.0	9.4	3.3	1.2	.4	− .4	1.5
20	3.3	19.1	6.1	14.1	3.1	7.4	9.0	3.0	1.0	.3	− .3	1.4
21	3.2	21.2	5.7	13.8	3.4	6.2	8.5	2.9	.6	.1	− .2	1.4
22	3.4	22.4	5.6	12.8	3.9	5.7	7.4	3.2	.4	− .1	− .2	1.3
23	3.8	22.7	5.5	10.8	7.2	5.2	6.3	3.2	.2	− .2	− .2	1.2
24	4.9	22.2	5.2	8.4	13.5	5.9	6.4	2.8	.1	− .3	− .1	1.1
25	5.7	20.7	5.0	6.4	17.2	6.0	11.4	2.3	.1	− .4	− .2	1.1
26	6.2	19.4	4.8	5.2	19.4	6.0	11.8	2.0	.0	− .5	− .2	1.0
27	6.6	17.9	4.7	4.4	20.4	5.8	10.3	1.9	.0	− .5	− .2	1.1
28	6.9	15.7	4.5	3.9	20.2	5.5	8.0	1.7	.1	− .4	− .2	1.1
29	7.7	.....	4.3	3.6	19.0	5.0	5.8	1.5	.0	− .4	.0	1.0
30	9.7	.....	4.1	3.3	17.3	6.9	5.0	1.3	− .1	− .3	− .1	1.3
31	11.0	.....	3.9	.....	14.8	.....	5.2	1.1	.....	− .4	.....	1.8

Daily discharge, in second-feet, of Alabama River at Selma, Ala., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	15,800	26,800	37,300	12,800	11,700	31,000	29,100	15,200	7,980	5,780	5,300	6,270
2	14,200	24,000	47,500	12,400	11,500	24,700	38,300	15,000	7,980	5,940	5,300	6,440
3	12,800	21,100	56,100	12,300	11,500	19,800	52,900	14,400	8,340	7,460	5,460	6,780
4	11,900	19,600	60,200	12,100	11,300	16,400	66,400	13,400	8,520	7,460	5,460	6,440
5	11,300	20,900	59,400	11,700	10,900	14,200	76,400	13,200	9,600	6,610	5,620	6,610
6	10,700	22,500	54,800	12,100	10,700	13,800	82,000	12,600	14,600	6,610	5,780	7,290
7	10,700	20,000	46,900	12,300	10,600	13,200	83,400	13,800	21,100	7,800	5,940	9,240
8	11,900	17,500	38,600	12,400	10,200	13,400	79,200	17,300	20,000	8,520	6,100	13,800
9	17,500	16,000	32,000	12,300	9,980	16,900	73,600	13,600	16,400	8,520	6,100	15,200
10	23,800	15,000	27,700	11,900	9,790	21,100	67,200	30,000	13,200	9,790	5,940	16,000
11	25,600	14,000	25,400	11,300	9,980	26,800	60,200	28,400	11,100	11,300	6,100	21,100
12	24,500	15,600	23,800	10,900	10,900	29,800	53,200	24,200	10,700	11,700	5,940	21,600
13	22,000	19,400	23,800	11,300	13,800	32,700	46,400	22,000	10,400	10,200	5,780	18,600
14	19,200	23,300	25,600	11,700	19,400	33,700	42,800	24,000	9,980	9,420	5,780	15,200
15	16,700	22,900	25,800	12,800	19,800	31,200	37,600	24,900	9,600	9,420	5,620	12,400
16	14,800	21,400	24,200	13,400	17,300	29,100	31,700	19,600	9,420	9,060	5,620	10,400
17	13,600	20,000	22,000	16,400	14,200	28,800	27,400	15,400	8,700	8,340	5,620	9,060
18	12,800	22,900	20,300	20,700	12,300	27,700	25,800	13,200	7,800	7,460	5,620	8,700
19	12,300	35,200	18,800	31,700	11,500	24,000	24,900	12,100	8,160	6,780	5,460	8,700
20	12,100	49,400	17,700	36,300	11,700	20,500	24,000	11,500	7,800	6,610	5,620	8,520
21	11,900	55,000	16,900	35,500	12,300	17,900	22,900	11,300	7,120	6,270	5,780	8,520
22	12,300	58,300	16,700	33,000	13,200	16,900	20,500	11,900	6,780	5,940	5,780	8,340
23	13,000	59,100	16,400	28,100	20,000	15,800	18,100	11,900	6,440	5,780	5,780	8,160
24	15,200	57,700	15,800	22,700	34,700	17,300	18,300	11,100	6,270	5,620	5,940	7,980
25	16,900	53,700	15,400	18,300	44,300	17,500	29,600	10,200	6,270	5,460	5,780	7,980
26	17,900	50,200	15,000	15,800	50,200	17,500	30,500	9,600	6,100	5,300	5,780	7,800
27	18,800	46,100	14,800	14,200	52,900	17,100	27,000	9,420	6,100	5,300	5,780	7,980
28	19,400	40,400	14,400	13,200	52,300	16,400	21,800	9,060	6,270	5,460	5,780	7,980
29	21,100	.....	14,000	12,600	49,100	15,400	17,100	8,700	6,100	5,460	6,100	7,800
30	25,600	.....	13,600	12,100	44,600	19,400	15,400	8,340	5,940	5,620	5,940	8,340
31	28,600	.....	13,200	.....	38,100	.....	15,800	7,980	.....	5,460	.....	9,240

NOTE.—These discharges were obtained from a well-defined rating curve.

Monthly discharge of Alabama River at Selma, Ala., for 1910.

[Drainage area, 15,400 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	28,600	10,700	16,600	1.08	1.24	B
February	59,100	14,000	31,000	2.01	2.09	A
March	60,200	13,200	27,600	1.79	2.06	A
April	36,300	10,900	16,800	1.09	1.22	B
May	52,900	9,790	21,300	1.38	1.59	A
June	33,700	13,200	21,300	1.38	1.54	A
July	83,400	15,400	40,600	2.64	3.04	A
August	30,000	7,980	14,900	.968	1.12	B
September	21,100	5,940	9,490	.616	.69	B
October	11,700	5,300	7,300	.474	.55	B
November	6,100	5,300	5,750	.373	.42	B
December	21,600	6,270	10,300	.669	.77	B
The year	83,400	5,300	18,500	1.20	16.33	

ETOWAH RIVER NEAR BALL GROUND, GA.

This station, which is located at the iron bridge about 3 miles from Ball Ground, was established May 16, 1907, in cooperation with the Forest Service.

The station is one-fourth mile below the mouth of Long Swamp Creek, which is a large tributary of Etowah River. No diversions are made above the station unless by the mining ditches near the headwaters, which have at times been in operation. The operation of a number of mills above may cause slight variations in flow, and on this account the gage is read twice a day.

The vertical staff gage, located 75 feet below the bridge was, on August 18, 1908, replaced by a standard chain gage attached to the upstream side of the bridge from which the measurements are made. The chain gage was set to read with the vertical staff at low stage and will differ only very slightly at other stages.

The left bank does not overflow, but the right bank overflows about 500 feet beyond the end of the bridge approach at high stages. The current is somewhat broken and is disturbed by rough, rocky bed and curved channel above. The rating has undergone some change that is due probably to silting of the bed below the station.

Discharge measurements of Etowah River near Ball Ground, Ga., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq ft.*	*Feet.*	*Sec.-ft.*
Apr. 21	M. R. Hall	80	292	3.18	677
21	do	80	294	3.18	645
21	do	80	292	3.18	725
May 20	do	99	533	5.70	2,160
21	do	115	1,100	10.98	6,530
21	do	115	1,100	10.98	6,550
Sept. 9	F. P. Thomas	97	358	3.45	802
9	do	97	357	3.32	782
10	do	79	296	2.90	578
10	do	79	273	2.88	532
Nov. 3	M. R. Hall	78	243	2.41	390
3	do	78	236	2.34	352

Daily gage height, in feet, of Etowah River near Ball Ground, Ga., for 1910.

[R. O. Ellis, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.15	3.2	5.2	2.9	2.8	3.6	4.0	3.0	3.2	2.55	2.35	2.3
2	2.95	3.1	4.6	2.9	2.8	3.5	4.2	3.2	3.1	2.4	2.4	2.3
3	2.9	3.35	4.1	2.9	2.75	4.3	4.4	3.1	3.5	2.35	2.3	2.4
4	2.9	3.3	3.8	2.85	2.75	3.6	4.3	3.3	3.0	2.4	2.3	2.4
5	2.8	3.1	3.6	2.9	2.75	5.6	5.2	3.7	2.75	2.7	2.4	6.3
6	3.0	3.1	3.6	2.9	2.8	6.4	5.4	3.3	2.7	2.6	2.3	6.5
7	5.2	3.0	3.4	2.8	3.2	4.45	5.2	4.3	2.7	3.05	2.3	4.7
8	3.7	3.0	3.3	2.8	8.0	4.0	4.3	3.6	2.6	3.65	2.3	4.5
9	3.4	3.0	3.3	2.8	6.6	3.8	5.2	3.25	3.7	3.25	2.3	3.7
10	3.2	3.0	3.45	2.8	4.3	4.2	4.3	3.1	2.8	2.8	2.4	2.9
11	3.1	3.05	3.8	2.75	3.7	4.0	3.8	2.95	2.7	2.6	2.3	2.6
12	3.05	3.3	3.7	2.8	3.65	4.6	3.7	2.9	2.6	2.6	2.3	2.5
13	3.0	3.25	3.4	2.9	3.75	4.3	3.6	2.9	2.5	2.5	2.35	2.4
14	3.05	3.1	3.3	2.8	3.4	3.9	4.1	3.0	2.5	2.5	2.35	2.4
15	3.0	3.1	3.2	2.8	3.2	4.0	3.5	3.2	2.45	2.45	2.3	2.5
16	3.0	3.2	3.2	4.2	3.2	3.95	3.3	2.9	2.45	2.4	2.3	2.55
17	2.9	4.5	3.2	6.3	3.7	3.6	3.45	2.9	2.4	2.4	2.3	2.5
18	2.9	6.7	3.15	4.25	4.75	3.5	3.4	2.8	2.5	2.35	2.3	2.6
19	3.0	4.4	3.1	3.5	4.0	3.4	3.3	2.75	2.4	2.3	2.3	2.55
20	3.0	3.8	3.1	3.3	7.4	3.35	3.2	2.75	2.4	2.3	2.25	2.5
21	4.0	4.1	3.1	3.2	10.0	3.8	3.1	2.7	2.4	2.3	2.3	2.5
22	3.5	4.1	3.1	3.1	6.2	3.75	3.1	2.7	2.35	2.4	2.35	2.4
23	3.3	3.8	3.05	3.05	5.8	3.5	3.1	2.7	2.4	2.4	2.3	2.55
24	3.6	3.6	3.05	3.1	6.5	3.45	3.2	2.65	2.4	2.3	2.4	3.3
25	3.6	3.45	3.0	3.1	6.8	3.5	3.3	2.8	2.4	2.3	2.3	2.8
26	3.4	3.3	3.0	3.1	5.0	3.3	3.1	2.85	2.3	2.3	2.3	2.7
27	3.3	3.3	3.0	3.1	4.4	3.3	3.3	2.8	2.3	2.35	2.3	2.6
28	3.6	4.05	3.0	3.1	4.1	3.3	3.1	2.7	2.3	2.6	2.5	2.5
29	3.8	.....	2.95	3.0	3.9	3.55	3.1	2.65	2.45	2.4	2.35	2.5
30	3.45	.....	2.95	2.9	3.85	3.75	3.15	2.6	3.9	2.3	2.3	3.0
31	3.3	.....	2.95	.....	3.7	.....	3.1	3.6	.....	2.4	.....	2.7

Daily discharge, in second-feet, of Etowah River near Ball Ground, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	668	690	1,810	560	520	880	1,080	600	690	428	360	345
2	580	645	1,430	560	520	830	1,200	690	645	375	375	345
3	560	758	1,140	560	500	1,250	1,310	645	830	360	345	375
4	560	735	980	540	500	880	1,250	735	600	375	345	375
5	520	645	880	560	500	2,090	1,810	930	500	480	375	2,600
6	600	645	880	560	520	2,670	1,950	735	480	445	345	2,740
7	1,810	600	780	520	690	1,340	1,810	1,250	480	622	345	1,490
8	930	600	735	520	3,930	1,080	1,250	880	445	905	345	1,370
9	780	600	735	520	2,820	980	1,810	712	930	712	345	930
10	690	600	805	520	1,250	1,200	1,250	645	520	520	375	560
11	645	622	980	500	930	1,080	980	580	480	445	345	445
12	622	735	930	520	905	1,430	930	560	445	445	345	410
13	690	712	780	560	955	1,250	880	560	410	410	360	375
14	622	645	735	520	780	1,030	1,140	600	410	410	360	375
15	600	645	690	520	690	1,080	830	690	392	392	345	410
16	600	690	690	1,200	690	1,060	735	560	392	375	345	428
17	560	1,370	690	2,600	930	880	805	560	375	375	345	410
18	560	2,900	668	1,220	1,520	830	780	520	410	360	345	445
19	600	1,310	645	830	1,080	780	735	500	375	345	345	428
20	600	980	645	735	3,450	758	690	500	375	345	330	410
21	1,080	1,140	645	690	5,680	980	645	480	375	345	345	410
22	830	1,140	645	645	2,520	955	645	480	360	375	360	375
23	735	980	622	622	2,230	830	645	480	375	375	345	428
24	880	880	622	645	2,740	805	690	462	375	345	375	735
25	880	805	600	645	2,970	830	735	520	375	345	345	520
26	780	735	600	645	1,680	735	645	540	345	345	345	480
27	735	735	600	645	1,310	735	735	520	345	360	345	445
28	880	1,110	600	645	1,140	735	645	480	345	445	410	410
29	980	.....	580	600	1,030	855	645	462	392	375	360	410
30	805	.....	580	560	1,000	955	668	445	1,030	345	345	600
31	735	.....	580	.....	930	.....	645	880	.....	375	.....	480

NOTE.—These discharges were obtained from a fairly well defined rating curve.

Monthly discharge of Etowah River near Ball Ground, Ga., for 1910.

[Drainage area, 466 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,810	520	743	1.59	1.83	B
February	2,900	600	880	1.89	1.97	B
March	1,810	580	784	1.68	1.94	B
April	2,600	500	699	1.50	1.67	B
May	5,680	500	1,510	3.24	3.74	A
June	2,670	735	1,060	2.27	2.53	A
July	1,950	645	986	2.12	2.44	A
August	1,250	445	619	1.33	1.53	B
September	1,030	345	483	1.04	1.16	B
October	905	345	424	.910	1.05	B
November	410	330	353	.758	.85	B
December	2,740	345	663	1.42	1.64	B
The year	5,680	330	768	1.65	22.35	

ETOWAH RIVER NEAR ROME, GA.

This station, which is located at Freemans Ferry, about 5 miles above Rome and 1 mile below Dikes Creek, was established August 17, 1904, to take the place of the station maintained at Rome about 5 miles below the present station. The original station at Rome was maintained from July 1 to December 31, 1903.

The few milldams above will seldom affect the flow, but to provide for possible daily fluctuations the gage is read twice a day. The vertical gage in three sections is located on the left bank about 250 feet below the measuring section at the ferry. No change has occurred in the datum of the gage. Discharge measurements are made from a boat attached to the ferry cable.

Both banks are subject to overflow during high water. Conditions of flow are probably permanent, and an excellent rating has been developed for low stages.

The following discharge measurement was made by M. R. Hall:

November 26: Width, 288 feet; area of section, 687 square feet; gage height, 1.82 feet; discharge, 928 second-feet.

Daily gage height, in feet, of Etowah River near Rome, Ga., for 1910.

[R. M. Pattillo, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.55	3.0	5.9	2.5	2.35	2.85	4.3	2.5	2.15	2.2	1.8	1.88
2	2.55	2.9	5.4	2.5	2.3	2.8	4.0	2.4	3.3	2.05	1.8	1.85
3	2.5	2.8	4.3	2.5	2.3	2.75	5.0	2.35	3.9	1.88	1.8	1.8
4	2.4	2.75	3.75	2.5	2.25	2.9	4.7	3.25	2.7	1.8	1.8	1.85
5	2.4	2.7	3.45	2.45	2.25	3.0	4.5	4.3	2.45	1.78	1.8	2.55
6	2.4	2.6	3.25	2.5	2.25	5.2	4.8	4.1	2.2	1.78	1.8	5.8
7	4.2	2.5	3.1	2.5	2.3	4.4	4.5	3.9	2.15	1.92	1.8	4.5
8	4.2	2.5	3.05	2.45	3.55	3.2	4.4	3.85	2.1	2.1	1.8	3.3
9	3.15	2.5	3.0	2.45	6.2	2.9	5.0	3.05	2.1	2.9	1.8	2.45
10	2.85	2.65	3.2	2.4	4.6	3.05	4.4	2.8	2.3	2.6	1.8	2.2
11	2.8	2.75	3.35	2.4	3.3	3.4	3.6	2.55	2.25	2.3	1.8	2.1
12	2.75	2.65	3.5	2.4	2.85	3.7	3.3	2.5	2.1	2.05	1.8	2.0
13	2.7	2.85	3.2	2.45	2.7	4.7	3.05	2.4	2.1	1.95	1.8	2.0
14	2.65	2.95	3.0	2.5	2.85	3.6	2.95	2.4	2.0	1.9	1.8	2.0
15	2.6	2.7	2.9	2.4	2.6	3.35	3.0	2.35	1.95	1.9	1.8	1.95
16	2.5	2.7	2.9	2.5	2.5	3.4	2.95	2.3	1.95	1.9	1.8	1.92
17	2.4	3.0	2.8	3.9	2.55	3.0	2.8	2.3	1.9	1.88	1.8	1.95
18	2.4	10.5	2.8	4.5	2.7	2.85	2.75	2.3	1.9	1.82	1.8	2.0
19	2.5	6.9	2.8	3.5	3.25	2.75	2.7	2.2	1.9	1.8	1.8	2.0
20	2.8	4.2	2.75	2.85	4.4	3.1	2.85	2.2	1.9	1.8	1.8	2.0
21	3.5	3.6	2.75	2.7	8.6	3.2	2.7	2.2	1.9	1.8	1.8	1.98
22	3.4	4.2	2.75	2.6	9.0	3.3	2.6	2.15	1.85	1.75	1.8	1.95
23	3.05	3.75	2.7	2.55	5.8	3.3	2.5	2.1	1.82	1.75	1.8	1.9
24	3.5	3.45	2.7	2.5	5.1	2.95	2.65	2.1	1.8	1.75	1.8	2.1
25	3.75	3.4	2.6	2.5	7.0	2.9	2.7	2.1	1.8	1.72	1.8	2.3
26	3.25	3.15	2.65	2.5	5.4	2.75	2.75	2.15	1.82	1.7	1.78	2.2
27	3.1	3.1	2.6	2.5	4.2	2.6	2.9	2.2	1.82	1.7	1.8	2.1
28	3.0	3.5	2.6	2.5	3.5	2.5	3.0	2.2	1.8	1.78	1.85	2.1
29	3.9	.....	2.6	2.5	3.2	3.5	2.6	2.1	1.78	1.9	1.92	2.0
30	3.4	.....	2.55	2.4	3.05	3.35	2.6	2.05	1.8	1.85	2.0	2.05
31	3.1	.....	2.5	.....	2.95	.....	2.5	2.1	.....	1.8	.....	2.2

Daily discharge, in second-feet, of Etowah River near Rome, Ga., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,730	2,340	7,420	1,660	1,480	2,120	4,540	1,660	1,250	1,300	895	971
2	1,730	2,200	6,520	1,660	1,420	2,060	4,000	1,540	2,800	1,140	895	942
3	1,660	2,060	4,540	1,660	1,420	1,990	5,800	1,480	3,820	971	895	895
4	1,540	1,990	3,560	1,660	1,360	2,200	5,200	2,720	1,920	895	895	942
5	1,540	1,920	3,050	1,600	1,360	2,340	4,900	4,540	1,600	876	895	1,730
6	1,540	1,790	2,720	1,660	1,360	6,160	5,440	4,180	1,300	876	895	7,240
7	4,360	1,660	2,490	1,660	1,420	4,720	4,900	3,820	1,250	1,010	895	4,900
8	4,360	1,660	2,420	1,600	3,220	2,640	4,720	3,730	1,200	1,200	895	2,800
9	2,570	1,660	2,340	1,600	7,960	2,200	5,800	2,420	1,200	2,200	895	1,600
10	2,120	1,860	2,640	1,540	5,080	2,420	4,720	2,060	1,420	1,790	895	1,300
11	2,060	1,990	2,880	1,540	2,800	2,960	3,300	1,730	1,360	1,420	895	1,200
12	1,990	1,860	3,130	1,540	2,120	3,470	2,800	1,660	1,200	1,140	895	1,090
13	1,920	2,120	2,640	1,600	1,920	5,260	2,420	1,540	1,200	1,040	895	1,090
14	1,860	2,270	2,340	1,660	2,120	3,300	2,270	1,540	1,090	990	895	1,090
15	1,790	1,920	2,200	1,540	1,790	2,880	2,340	1,480	1,040	990	895	1,040
16	1,660	1,920	2,200	1,660	1,660	2,960	2,270	1,420	1,040	990	895	1,010
17	1,540	2,340	2,060	3,820	1,730	2,340	2,060	1,420	990	971	895	1,040
18	1,540	15,700	2,060	4,900	1,920	2,120	1,990	1,420	990	914	895	1,090
19	1,660	9,220	2,060	3,130	2,720	1,990	1,920	1,300	990	895	895	1,090
20	2,060	4,360	1,990	2,120	4,720	2,490	2,120	1,300	990	895	895	1,090
21	3,130	3,300	1,990	1,920	12,300	2,640	1,920	1,300	990	895	895	1,070
22	2,960	4,360	1,990	1,790	13,000	2,800	1,790	1,250	942	848	895	1,040
23	2,420	3,560	1,920	1,730	7,240	2,800	1,660	1,200	914	848	895	990
24	3,130	3,050	1,920	1,660	5,980	2,270	1,860	1,200	895	848	895	1,200
25	3,560	2,960	1,790	1,660	9,400	2,200	1,920	1,200	895	819	895	1,420
26	2,720	2,570	1,860	1,660	6,520	1,990	1,990	1,250	914	800	876	1,300
27	2,490	2,490	1,790	1,660	4,360	1,790	2,200	1,300	914	800	895	1,200
28	2,340	3,130	1,790	1,660	3,130	1,660	2,340	1,300	895	876	942	1,200
29	3,820	.....	1,790	1,660	2,640	3,130	1,790	1,200	876	990	1,010	1,090
30	2,960	.....	1,730	1,540	2,420	2,880	1,790	1,140	895	942	1,090	1,140
31	2,490	.....	1,660	.....	2,270	.....	1,660	1,200	.....	895	.....	1,300

NOTE.—These discharges were obtained from a rating curve which is fairly well defined below 4,000 second-feet. Above 10,200 second-feet the curve is only approximate.

Monthly discharge of Etowah River near Rome, Ga., for 1910.

[Drainage area, 1,800 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	4,360	1,540	2,360	1.31	1.51	A
February	15,700	1,660	3,150	1.75	1.82	A
March	7,420	1,660	2,630	1.46	1.68	A
April	4,900	1,540	1,890	1.05	1.17	A
May	13,000	1,360	3,830	2.13	2.46	A
June	6,160	1,660	2,760	1.53	1.71	A
July	5,800	1,660	3,050	1.69	1.95	A
August	4,540	1,140	1,820	1.01	1.16	A
September	3,820	876	1,260	.700	.78	A
October	2,200	800	1,030	.572	.66	A
November	1,090	876	906	.503	.56	A
December	7,240	895	1,520	.844	.97	A
The year	15,700	800	2,180	1.21	16.43	

AMICALOLA CREEK NEAR POTTS MOUNTAIN, GA.

This station is located at Steeles Bridge, 2 miles east of Potts Mountain and 15 miles from Ball Ground, Ga. It is one-fourth mile above the mouth of Holly Creek. It was established June 21, 1907, discontinued December 31, 1908, and reestablished June 7, 1910.

The bed of the stream is rocky and not very rough. The current is medium swift. A rocky shoal with considerable slope, 150 feet below, favors a constant rating, but sufficient measurements have not been made to define the rating curve.

Measurements are made from a covered wagon bridge. The vertical staff gage is attached to a tree on the right bank just below the bridge.

Daily gage height, in feet, of Amicalola Creek near Potts Mountain, Ga., for 1910.

[J. A. Whitmore, observer.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1....	.....	1.8	1.55	1.6	1.4	1.3	1.25	16....	1.85	1.7	1.6	1.4	1.35	1.25	1.3
2....	.....	2.0	1.55	1.5	1.35	1.3	1.25	17....	1.85	1.7	1.55	1.4	1.35	1.25	1.3
3....	.....	2.1	1.5	1.6	1.35	1.3	1.25	18....	1.8	1.7	1.55	1.4	1.35	1.25	1.3
4....	.....	2.0	1.85	1.75	1.35	1.3	1.25	19....	1.75	1.7	1.5	1.4	1.35	1.25	1.3
5....	.....	2.9	1.7	1.65	1.4	1.3	3.0	20....	1.7	1.7	1.5	1.4	1.3	1.25	1.3
6....	.....	2.2	2.95	1.55	1.4	1.25	2.2	21....	1.7	1.65	1.5	1.35	1.3	1.25	1.3
7....	2.0	2.3	1.8	1.5	1.4	1.25	2.1	22....	1.7	1.65	1.5	1.35	1.3	1.25	1.3
8....	1.95	2.1	2.1	1.45	1.5	1.25	2.0	23....	1.7	1.6	1.45	1.35	1.3	1.25	1.5
9....	1.9	2.0	1.9	1.6	1.5	1.25	1.9	24....	1.7	1.6	1.45	1.3	1.3	1.25	1.5
10....	1.9	1.9	1.7	1.45	1.4	1.25	1.75	25....	1.7	1.6	1.45	1.3	1.3	1.25	1.4
11....	1.9	1.85	1.6	1.45	1.4	1.25	1.6	26....	1.7	1.6	1.5	1.3	1.3	1.25	1.4
12....	1.9	1.85	1.55	1.45	1.35	1.25	1.5	27....	1.65	1.6	1.5	1.3	1.3	1.25	1.4
13....	1.9	1.8	1.55	1.45	1.35	1.25	1.35	28....	1.65	1.6	1.45	1.3	1.3	1.25	1.4
14....	1.9	1.75	1.55	1.45	1.35	1.25	1.35	29....	1.8	1.55	1.45	1.3	1.3	1.25	1.4
15....	1.9	1.7	1.8	1.45	1.35	1.25	1.3	30....	1.8	1.55	1.5	1.9	1.3	1.25	1.4
								31....	.....	1.55	1.6	.....	1.3	.....	1.4

TALLAPOOSA RIVER AT STURDEVANT, ALA.

This station, which is located at the Central of Georgia Railway bridge one-fourth mile west of Sturdevant, 6 miles east of Alexander City, and about 5 miles below the mouth of Hillabee Creek, was established July 19, 1900, to take the place of the Milstead, Ala., station, which was to be abandoned when the great water-power plants immediately above were put in operation.

The flow is under no artificial control except at a number of small mills a great distance upstream.

Prior to 1906 a standard chain gage was attached to the bridge. During 1906 the bridge was replaced by a new one and the present vertical staff gage was located at Stowe's boat landing, about 2,000 feet upstream. All gage readings on the new gage are reduced to conform to the standard gage readings at the bridge.

At low stage the current in a portion of the channel becomes very sluggish, making measurements inaccurate at such stages, and for this reason some of the low-water measurements have been made from a boat at swifter sections near by. Both banks overflow for about 200 feet at extreme high stages. Conditions of flow appear to be somewhat changeable, but a fairly good rating curve has been developed. No measurements were made in 1910, but one made in 1911 indicates that the 1909 rating is applicable for 1910.

Daily gage height, in feet, of Tallapoosa River at Sturdevant, Ala., for 1910.

[C. J. Stowe, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.25	3.25	8.1	2.5	2.25	1.9	16.5	1.95	1.4	2.25	1.05	1.65
2	2.25	2.95	7.8	2.5	2.15	1.85	14.2	1.9	1.55	1.6	1.05	1.4
3	2.25	3.65	6.4	2.5	2.05	1.75	11.9	1.8	1.8	1.4	1.2	1.35
4	2.25	3.8	5.1	2.5	2.05	1.65	9.4	1.7	2.6	1.2	1.15	1.45
5	2.25	3.3	4.3	2.55	2.05	1.7	7.0	3.0	2.8	1.1	1.3	3.9
6	2.35	3.1	3.9	2.8	2.05	1.85	5.3	4.7	1.9	1.15	1.5	5.0
7	3.25	2.85	3.7	2.8	2.0	1.95	5.0	6.1	1.65	2.4	1.6	4.3
8	4.0	2.75	3.5	2.65	2.3	1.9	5.2	7.0	1.5	3.25	1.5	3.3
9	3.7	2.7	3.4	2.4	2.65	1.9	4.7	4.7	1.65	2.95	1.4	2.65
10	3.15	2.6	3.3	2.35	3.4	3.0	4.1	3.85	1.9	2.8	1.35	2.3
11	2.8	3.15	3.55	2.35	2.8	3.3	4.0	3.45	1.95	2.55	1.25	2.1
12	2.6	4.4	3.6	2.4	2.35	3.7	3.9	4.4	1.95	2.05	1.25	1.9
13	2.45	4.3	3.45	3.1	2.1	3.25	3.85	4.1	1.8	1.75	1.2	1.9
14	2.4	4.3	3.3	3.25	2.0	3.8	3.35	2.85	1.5	1.55	1.2	1.8
15	2.35	3.4	3.1	2.8	1.95	3.65	2.85	2.5	1.5	1.4	1.25	1.7
16	2.35	3.1	3.0	2.75	1.9	2.95	2.55	2.3	1.4	1.4	1.15	1.7
17	2.25	3.6	2.95	4.9	1.9	2.45	2.95	2.15	1.25	1.25	1.2	1.7
18	2.25	6.5	2.85	4.5	2.5	2.3	2.8	2.05	1.05	1.2	1.25	1.8
19	2.35	7.0	3.0	3.7	2.6	2.0	2.65	2.05	.96	1.15	1.3	1.9
20	2.45	6.0	3.2	3.25	2.65	1.9	2.6	2.35	1.05	1.05	1.45	1.9
21	3.1	4.5	3.0	2.8	3.55	2.9	2.45	2.35	.96	1.05	1.35	1.8
22	3.3	5.3	2.9	2.65	3.6	3.3	2.4	2.05	.95	1.0	1.35	1.7
23	3.3	4.9	2.85	2.6	4.5	2.85	2.45	1.75	1.35	.94	1.35	1.7
24	3.3	4.8	2.85	2.5	4.2	2.55	2.45	1.7	1.2	.85	1.25	1.9
25	3.3	5.2	2.8	2.4	4.3	2.3	2.7	1.7	.96	.88	1.3	1.95
26	3.25	4.6	2.8	2.4	3.8	2.3	2.6	1.7	.82	.81	1.35	1.9
27	3.05	4.1	2.75	2.35	3.2	2.35	2.6	1.6	.72	.98	1.3	1.9
28	3.5	4.8	2.7	2.4	2.7	1.95	2.3	1.6	.80	1.2	1.35	1.8
29	4.3	.....	2.65	2.4	2.4	2.8	2.1	1.5	1.90	1.25	2.45	1.8
30	4.1	.....	2.6	2.4	2.15	5.8	2.15	1.45	3.3	1.2	1.95	2.85
31	3.65	.....	2.6	.....	1.95	.....	2.1	1.45	.....	1.15	.....	3.3

Daily discharge, in second-feet, of Tallapoosa River at Sturdevant, Ala., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,840	3,190	15,900	2,140	1,840	1,460	42,800	1,510	1,020	1,840	782	1,220
2	1,840	2,740	14,900	2,140	1,720	1,410	35,400	1,460	1,140	1,180	782	1,020
3	1,840	3,860	10,600	2,140	1,620	1,320	28,000	1,360	1,360	1,020	880	985
4	1,840	4,130	7,020	2,140	1,620	1,220	20,000	1,270	2,270	880	848	1,060
5	1,840	3,270	5,120	2,200	1,620	1,270	12,400	2,810	2,530	815	950	4,320
6	1,960	2,960	4,320	2,530	1,620	1,410	7,540	6,010	1,460	848	1,100	6,760
7	3,190	2,600	3,950	2,530	1,560	1,510	6,760	9,720	1,220	2,020	1,180	5,120
8	4,510	2,460	3,600	2,340	1,900	1,460	7,280	12,400	1,100	3,190	1,100	3,270
9	3,950	2,400	3,430	2,020	2,340	1,460	6,010	6,010	1,220	2,740	1,020	2,340
10	3,040	2,270	3,270	1,960	3,430	2,810	4,710	4,220	1,460	2,530	985	1,900
11	2,530	2,880	3,680	1,960	2,530	3,270	4,510	3,520	1,510	2,200	915	1,670
12	2,270	5,330	3,770	2,020	1,960	3,950	4,320	5,330	1,510	1,620	915	1,460
13	2,080	5,120	3,520	2,960	1,670	3,190	4,220	4,710	1,360	1,320	880	1,460
14	2,020	5,120	3,270	3,190	1,560	4,130	3,350	2,600	1,100	1,140	880	1,360
15	1,960	3,430	2,960	2,530	1,510	3,860	2,600	2,140	1,100	1,020	915	1,270
16	1,960	2,960	2,810	2,460	1,460	2,740	2,200	1,900	1,020	1,020	848	1,270
17	1,840	3,770	2,740	6,500	1,460	2,080	2,740	1,720	915	915	880	1,270
18	1,840	10,800	2,600	5,550	2,140	1,900	2,530	1,620	782	880	915	1,360
19	1,960	12,400	2,810	3,950	2,270	1,560	2,340	1,620	726	848	950	1,460
20	2,080	9,440	3,110	3,190	2,340	1,460	2,270	1,960	782	782	1,060	1,460
21	2,960	5,550	2,810	2,530	3,680	2,670	2,080	1,960	726	782	985	1,360
22	3,270	7,540	2,670	2,340	3,770	3,270	2,020	1,620	720	750	985	1,270
23	3,270	6,500	2,600	2,270	5,550	2,600	2,080	1,320	985	714	985	1,270
24	3,270	6,250	2,600	2,140	4,910	2,200	2,080	1,270	880	662	915	1,460
25	3,270	7,280	2,530	2,020	5,120	1,900	2,400	1,270	726	679	950	1,510
26	3,190	5,770	2,530	2,020	4,130	1,900	2,270	1,270	646	640	985	1,460
27	2,880	4,710	2,460	1,960	3,110	1,960	2,270	1,180	591	738	950	1,460
28	3,600	6,250	2,400	2,020	2,400	1,510	1,900	1,180	635	880	985	1,360
29	5,120	.....	2,340	2,020	2,020	2,530	1,670	1,100	1,460	915	2,080	1,360
30	4,710	.....	2,270	2,020	1,720	8,880	1,720	1,060	3,270	880	1,510	2,600
31	3,860	.....	2,270	.....	1,510	.....	1,670	1,060	.....	848	.....	3,270

NOTE.—These discharges were obtained from a well-defined rating curve.

Monthly discharge of Tallapoosa River at Sturdevant, Ala., for 1910.

[Drainage area, 2,500 sqare miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	5,120	1,840	2,770	1.11	1.28	A
February	12,400	2,270	5,030	2.01	2.09	A
March	15,900	2,270	4,220	1.69	1.95	A
April	6,500	1,960	2,590	1.04	1.16	A
May	5,550	1,460	2,450	.980	1.13	A
June	8,880	1,220	2,430	.972	1.08	A
July	42,800	1,670	7,230	2.89	3.33	A
August	12,400	1,060	2,840	1.14	1.31	A
September	3,270	591	1,210	.484	.54	A
October	3,190	640	1,200	.480	.55	A
November	2,080	782	1,000	.400	.45	A
December	6,760	985	1,950	.780	.90	A
The year	42,800	591	2,910	1.16	15.77	

TOMBIGBEE RIVER AT COLUMBUS, MISS.

This station is located at the county highway bridge at the south end of Main Street in the city of Columbus, Miss. Gage heights from 1900 to 1904 have been furnished by the United States Weather Bureau, and estimates of discharge are based thereon. On July 13, 1905, the present chain gage was installed by the United States Geological Survey at the highway bridge 1,000 feet above the original location of the gage of the United States Weather Bureau. The new gage was set to read the same as the first United States Weather Bureau gage at low water, which makes it practically on the same datum, as the low-water surface is almost level. In 1906 a new gage was put in by the United States Weather Bureau. It is fastened to the channel pier of the Mobile & Ohio Railroad bridge. Discharge measurements are made from the bridge.

The right bank is high and seldom overflows. The left bank overflows only under the bridge approach at a gage height of about 20 feet. The bed of the stream is of soft limestone or chalk, and conditions of flow are somewhat changeable at low stages. No measurements were made in 1910, but one in 1911 indicates that the 1909 rating is applicable for 1910.

Daily gage height, in feet, of Tombigbee River at Columbus, Miss., for 1910.

[C. R. Shackelford, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	−1.1	−0.6	10.8	−1.7	−2.1	−1.4	4.3	−1.1	−3.4	−3.9	−3.5	−3.0
2	−1.5	− .8	8.9	−1.8	−2.2	−1.8	6.8	−1.2	−3.4	−3.9	−3.5	−2.6
3	−1.8	−1.0	8.2	−1.8	−2.4	−2.1	7.2	−1.6	−2.8	−3.9	−3.5	−2.8
4	−1.9	−1.2	7.3	−1.8	−2.5	−2.3	7.3	−2.0	−3.1	−3.9	−3.5	−3.0
5	−2.0	−1.2	5.9	−1.8	−2.6	−2.4	7.3	−2.3	−2.2	−3.9	−3.5	−3.1
6	−1.7	−1.0	4.3	−1.6	−2.6	−2.5	7.6	− .7	−2.5	−3.9	−3.5	−2.3
7	2.7	− .7	3.0	−1.2	−2.7	−2.6	8.9	−1.3	−2.8	−3.9	−3.6	−1.3
8	4.1	− .9	2.1	−1.0	−2.8	−2.5	10.9	− .6	−2.9	−3.9	−3.6	− .5
9	4.9	−1.1	1.5	− .7	−2.9	−2.5	13.2	− .8	−3.2	−3.7	−3.6	− .2
10	5.3	−1.3	1.0	−1.0	−3.0	− .1	14.9	− .7	−3.2	−3.4	−3.5	− .9
11	5.0	−1.5	1.0	−1.3	−3.0	5.7	17.4	−1.1	−3.3	−3.3	−3.5	−1.2
12	4.1	−1.3	1.0	−1.7	−3.0	7.2	19.1	−1.5	−3.5	−3.4	−3.5	−1.9
13	3.0	−1.0	1.3	−1.9	−3.0	7.7	19.1	−1.6	−3.6	−3.5	−3.5	−2.3
14	2.1	− .7	1.2	−2.0	−3.1	8.0	17.8	−2.1	−3.6	−3.5	−3.5	−2.5
15	1.6	− .5	.5	−2.1	−3.1	7.3	15.4	−2.2	−3.7	−3.3	−3.6	−2.6
16	.9	− .4	.1	−1.9	−3.2	4.5	12.5	−2.3	−3.8	−2.6	−3.5	−2.8
17	.2	.1	− .2	− .8	−3.2	1.7	10.4	−2.5	−3.8	−1.5	−3.6	−2.9
18	− .2	8.2	− .5	1.2	−3.3	.1	8.0	−2.7	−3.8	−1.8	−3.6	−3.0
19	− .4	9.3	− .7	2.1	−3.3	−1.0	5.2	−2.9	−3.9	−2.5	−3.6	−3.0
20	.0	9.9	− .8	2.1	−3.0	−1.5	3.0	−3.0	−3.9	−2.9	−3.6	−3.0
21	4.8	11.4	− .9	1.4	−2.4	−1.6	2.6	−3.1	−3.9	−3.2	−3.6	−3.0
22	5.8	13.3	−1.0	.7	− .4	−1.3	2.6	−2.9	−3.9	−3.4	−3.6	−3.0
23	6.3	13.7	−1.0	.1	2.8	2.3	1.3	−2.4	−3.9	−3.5	−3.6	−2.9
24	6.7	13.2	−1.1	− .7	4.2	2.1	.6	−1.0	−3.8	−3.5	−3.6	−1.6
25	6.6	12.7	−1.2	−1.3	4.9	1.3	.1	−2.2	−3.9	−3.6	−3.6	− .6
26	5.7	12.3	−1.2	−1.5	5.4	.2	1.2	−2.6	−3.9	−3.6	−3.6	− .1
27	3.3	11.8	−1.3	−1.7	4.9	.1	.3	−2.7	−3.9	−3.7	−3.4	.0
28	2.1	11.6	−1.4	−1.9	3.2	− .3	− .1	−2.8	−4.0	−3.7	−3.2	− .6
29	1.0	.....	−1.5	−1.9	1.4	− .2	− .6	−3.0	−4.0	−3.7	−3.3	−1.2
30	.2	.....	−1.6	−2.1	.2	3.9	−1.4	−3.1	−4.0	−3.7	−3.2	−1.6
31	− .3	.....	−1.7	.....	− .8	.....	−1.7	−3.2	.....	−3.5	.....	−1.6

Daily discharge, in second-feet, of Tombigbee River at Columbus, Miss., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,730	2,090	16,800	1,320	1,070	1,520	7,310	1,730	420	250	380	590
2	1,460	1,940	13,900	1,260	1,010	1,260	10,800	1,660	420	250	380	785
3	1,260	1,800	12,800	1,260	895	1,070	11,400	1,390	685	250	380	685
4	1,200	1,660	11,500	1,260	840	950	11,500	1,130	545	250	380	590
5	1,130	1,660	9,480	1,260	785	895	11,500	950	1,010	250	380	545
6	1,320	1,800	7,310	1,390	785	840	11,900	2,020	840	250	380	950
7	5,340	2,020	5,680	1,660	735	785	13,900	1,590	685	250	345	1,590
8	7,050	1,870	4,650	1,800	685	840	17,000	2,090	635	250	345	2,170
9	8,100	1,730	4,000	2,020	635	840	20,800	1,940	500	310	345	2,410
10	8,640	1,590	3,500	1,800	590	2,500	23,700	2,020	500	420	380	1,870
11	8,240	1,460	3,500	1,590	590	9,200	28,000	1,730	460	460	380	1,660
12	7,050	1,590	3,500	1,320	590	11,400	30,900	1,460	380	420	380	1,200
13	5,680	1,800	3,800	1,200	590	12,100	30,900	1,390	345	380	380	950
14	4,650	2,020	3,700	1,130	545	12,500	28,700	1,070	345	380	380	840
15	4,110	2,170	3,020	1,070	545	11,500	24,600	1,010	310	460	345	785
16	3,400	2,250	2,660	1,200	500	7,570	19,600	950	280	785	380	685
17	2,760	2,660	2,410	1,940	500	4,220	16,200	840	280	1,460	345	635
18	2,410	12,800	2,170	3,700	460	2,660	12,500	735	280	1,260	345	590
19	2,250	14,500	2,020	4,650	460	1,800	8,510	635	250	840	345	590
20	2,580	15,400	1,940	4,650	590	1,460	5,680	590	250	635	345	590
21	7,970	17,800	1,870	3,900	895	1,390	5,220	545	250	500	345	590
22	9,340	21,000	1,800	3,210	2,250	1,590	5,220	635	250	420	345	590
23	10,000	21,700	1,800	2,660	5,450	4,880	3,800	895	250	380	345	635
24	10,600	20,800	1,730	2,020	7,180	4,650	3,120	1,800	280	380	345	1,390
25	10,500	20,000	1,660	1,590	8,100	3,800	2,660	1,010	250	345	345	2,090
26	9,200	19,300	1,660	1,460	8,780	2,760	3,700	785	250	345	345	2,500
27	6,660	18,500	1,590	1,320	8,100	2,660	2,840	735	250	310	420	2,580
28	4,650	18,100	1,520	1,200	5,920	2,330	2,500	685	220	310	500	2,090
29	3,500	.....	1,460	1,200	3,900	2,410	2,090	590	220	310	460	1,660
30	2,760	.....	1,390	1,070	2,760	6,790	1,520	545	220	310	500	1,390
31	2,330	.....	1,320	.....	1,940	.....	1,320	500	.....	380	.....	1,390

NOTE.—These discharges were obtained from a well-defined rating curve.

Monthly discharge of Tombigbee River at Columbus, Miss., for 1910.

[Drainage area, 4,440 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	10,600	1,130	5,090	1.15	1.33	A
February	21,700	1,460	8,290	1.87	1.95	A
March	16,800	1,320	4,390	.989	1.14	A
April	4,650	1,070	1,900	.428	.48	B
May	8,780	460	2,220	.500	.58	B
June	12,500	785	3,970	.894	1.00	B
July	30,900	1,320	12,260	2.75	3.17	A
August	2,090	500	1,150	.259	.30	B
September	1,010	220	395	.089	.10	C
October	1,460	250	445	.100	.12	C
November	500	345	376	.085	.09	C
December	2,580	545	1,210	.273	.31	B
The year	30,900	220	3,450	.777	10.57	

TOMBIGBEE RIVER AT EPES, ALA.

This station is located at the bridge of the Alabama Great Southern Railroad one-half mile from Epes, Ala.

A record of approximate gage heights, based on a gage painted on one of the bridge piers, has been kept by the Alabama Great Southern Railroad for a number of years. During 1900 and 1901 discharge measurements were made by the United States Geological Survey and a rating was developed for these years. November 29, 1904, the station was reestablished by the United States Geological Survey.

Discharge measurements are made from the downstream side of the railroad bridge.

The datum of the chain gage, which is attached to the railroad bridge, is practically the same as that of the old gage and has not been changed since its installation. The right bank is high and is not subject to overflow. The left bank will not overflow until the river reaches a stage of 38 feet. During floods it overflows for seven-eighths of a mile under the trestle approach to the bridge.

Conditions of flow at this point are practically permanent and a good rating has been developed. No measurements were made in 1910, but measurements made in 1911 indicate that the 1909 rating is applicable for 1910.

Daily gage height, in feet, of Tombigbee River at Epes, Ala., for 1910.

[J. C. Horton and George Haven, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.65	5.0	26.4	3.25	2.75	4.25	11.8	4.3	1.55	0.6	0.8	1.2
2	3.95	5.0	26.4	3.2	2.65	3.35	12.5	4.85	1.5	.5	.9	1.3
3	3.55	6.0	25.4	3.2	2.5	2.9	13.5	4.5	1.4	.5	.95	1.75
4	3.05	5.0	23.0	3.1	2.35	2.45	15.6	4.2	1.4	.6	1.0	1.85
5	2.85	4.2	20.6	3.1	2.2	2.95	16.0	4.2	1.5	.6	1.0	2.0
6	4.7	3.95	18.1	3.3	2.1	4.25	16.2	5.8	1.6	.7	1.0	1.9
7	7.0	3.8	14.9	3.9	2.0	4.55	16.4	5.6	2.0	1.4	1.0	1.8
8	7.5	4.05	12.0	3.9	1.9	3.5	17.2	6.0	1.75	1.15	1.0	2.35
9	9.9	4.05	10.1	4.0	1.8	3.0	19.2	6.4	1.6	1.05	1.1	3.35
10	11.0	3.85	9.0	4.15	1.7	6.7	22.4	5.8	1.55	1.1	1.1	4.05
11	11.6	4.75	8.8	4.15	1.7	14.2	24.4	5.2	1.4	1.2	1.15	4.05
12	11.7	5.8	8.6	3.95	1.65	16.8	26.3	4.55	1.3	1.35	1.1	3.35
13	10.5	5.2	8.4	3.5	1.6	16.7	27.4	4.1	1.2	1.3	1.1	3.2
14	9.2	4.8	8.2	3.15	1.6	16.2	28.6	3.9	1.1	1.3	1.1	2.85
15	8.1	4.8	7.5	2.85	1.55	16.0	29.3	3.4	1.0	1.3	1.0	2.45
16	7.3	4.95	6.4	3.1	1.4	15.2	29.6	3.2	.9	1.3	1.0	2.15
17	6.5	5.8	5.7	6.5	1.4	12.5	29.0	3.2	.8	1.3	.9	2.0
18	5.6	10.0	5.2	7.2	1.3	9.0	27.3	2.9	.8	2.15	1.0	2.15
19	5.0	15.4	4.85	8.9	1.3	6.6	24.3	3.0	.7	2.85	1.0	2.1
20	4.75	17.8	4.8	8.4	1.3	5.1	19.3	2.2	.7	2.6	.95	2.0
21	5.0	19.0	4.6	8.2	1.5	4.05	13.2	1.95	.7	2.2	.9	1.9
22	8.3	20.8	4.45	8.0	1.95	3.4	10.0	1.95	.6	1.85	.95	1.9
23	11.0	21.8	4.25	7.8	3.05	3.2	9.2	1.9	.6	1.35	.9	2.05
24	12.0	22.9	4.15	5.9	6.8	5.9	8.9	2.0	.7	1.2	.9	2.45
25	12.5	23.6	4.05	4.8	8.4	6.6	9.2	2.3	.7	1.15	.9	2.6
26	12.8	23.6	4.0	4.05	9.5	6.4	9.4	2.8	.85	1.0	.9	3.65
27	12.1	24.1	3.9	3.6	10.2	5.8	9.4	2.45	.85	.9	.9	4.45
28	10.8	26.2	3.85	3.25	10.4	5.3	8.8	2.15	.7	.85	.95	4.9
29	9.2	.....	3.65	3.05	8.8	5.2	7.6	2.0	.65	.85	1.0	4.8
30	6.8	.....	3.45	2.9	6.8	12.0	6.2	1.85	.6	.85	1.2	4.5
31	5.8	.....	3.35	.....	5.4	.....	5.0	1.65	.....	.8	.....	3.8

Daily discharge, in second-feet, of Tombigbee River at Epes, Ala., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,710	4,060	26,300	2,380	1,950	3,310	11,100	3,360	1,080	592	682	880
2	3,020	4,060	26,300	2,340	1,870	2,480	11,800	3,910	1,060	550	730	940
3	2,660	5,060	25,200	2,340	1,740	2,080	12,900	3,560	997	550	755	1,210
4	2,200	4,060	22,700	2,250	1,620	1,700	15,000	3,260	997	592	780	1,270
5	2,030	3,260	20,200	2,250	1,510	2,120	15,500	3,260	1,060	592	780	1,370
6	3,760	3,020	17,600	2,430	1,440	3,310	15,700	4,860	1,120	636	780	1,300
7	6,100	2,890	14,300	2,980	1,370	3,610	15,900	4,650	1,370	997	780	1,240
8	6,620	3,120	11,300	2,980	1,300	2,610	16,700	5,060	1,210	859	780	1,620
9	9,120	3,120	9,320	3,070	1,240	2,160	18,800	5,480	1,120	806	832	2,480
10	10,300	2,920	8,180	3,210	1,180	5,790	22,100	4,860	1,080	832	832	3,120
11	10,900	3,810	7,970	3,210	1,180	13,600	24,200	4,250	997	886	859	3,120
12	11,000	4,860	7,760	3,020	1,140	16,300	26,200	3,610	941	969	832	2,480
13	9,740	4,250	7,560	2,610	1,120	16,200	27,300	3,170	886	941	832	2,340
14	8,390	3,860	7,350	2,300	1,120	15,700	28,600	2,980	832	941	832	2,030
15	7,240	3,860	6,620	2,030	1,080	15,500	29,300	2,520	780	941	780	1,700
16	6,410	4,010	5,480	2,250	997	14,600	29,600	2,340	730	941	780	1,480
17	5,580	4,860	4,750	5,580	997	11,800	29,000	2,340	682	941	730	1,370
18	4,650	9,220	4,250	6,310	941	8,180	27,200	2,080	682	1,480	780	1,480
19	4,060	14,800	3,910	8,080	941	5,680	24,100	2,160	636	2,030	780	1,440
20	3,810	17,300	3,860	7,560	941	4,160	18,900	1,510	636	1,820	755	1,370
21	4,060	18,600	3,660	7,350	1,060	3,120	12,500	1,340	636	1,510	730	1,300
22	7,450	20,500	3,510	7,140	1,340	2,520	9,220	1,340	592	1,270	755	1,300
23	10,300	21,500	3,310	6,930	2,200	2,340	8,390	1,300	592	969	730	1,400
24	11,300	22,600	3,210	4,960	5,890	4,960	8,080	1,370	636	886	730	1,700
25	11,800	23,400	3,120	3,860	7,560	5,680	8,390	1,580	636	859	730	1,820
26	12,100	23,400	3,070	3,120	8,700	5,480	8,600	1,990	706	780	730	2,750
27	11,400	23,900	2,980	2,700	9,430	4,860	8,600	1,700	706	730	730	3,510
28	10,100	26,100	2,930	2,380	9,640	4,350	7,970	1,480	636	706	755	3,960
29	8,390	.....	2,750	2,200	7,970	4,250	6,720	1,370	614	706	780	3,860
30	5,890	.....	2,560	2,080	5,890	11,300	5,270	1,270	592	706	886	3,560
31	4,860	.....	2,480	.....	4,450	.....	4,060	1,140	.....	682	.....	2,890

NOTE.—These discharges were obtained from a rating curve which is well defined between 1,300 and 15,000 second-feet.

Monthly discharge of Tombigbee River at Epes, Ala., for 1910.

[Drainage area, 8,830 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	12,100	2,030	7,060	0.800	0.92	A
February	26,100	2,890	10,200	1.16	1.21	A
March	26,300	2,480	8,850	1.00	1.15	A
April	8,080	2,080	3,740	.424	.47	B
May	9,640	941	2,900	.328	.38	B
June	16,300	1,700	6,660	.754	.84	A
July	29,600	4,060	16,400	1.86	2.14	A
August	5,480	1,140	2,750	.311	.36	B
September	1,370	592	841	.095	.11	B
October	2,030	550	926	.105	.12	B
November	886	682	775	.088	.10	B
December	3,960	886	2,010	.228	.26	B
The year	29,600	550	5,240	.593	8.06	

BLACK WARRIOR RIVER NEAR CORDOVA, ALA.

This station is located at the Kansas City, Memphis & Birmingham Railroad bridge which crosses the river below the mouth of Cane Creek, 1 mile east of Cordova. It is 12 miles below the junction of Mulberry and Sipsey forks and 6 miles below Blackwater Creek.

On May 21, 1900, discharge measurements were begun by the United States Geological Survey, and the gage which had formerly

been used by the United States Weather Bureau was repaired and read daily. Since 1904 the United States Army Engineer Corps has maintained the gage and furnished readings to the United States Geological Survey.

The portion of the gage below 12 feet has been changed a number of times and also its location. Although the datum has been supposed to remain the same, it is probable that the readings have been affected by these changes. The portion from 12 to 55 feet is a vertical timber fastened to the bridge pier on the left bank of the river. This section, although still in place, has been superseded by two new vertical sections on the right bank, the upper one being attached to the bridge abutment, and a new sloping section reading up to 10 feet has replaced the older one, which was washed out during 1910.

Discharge measurements are made at the railroad bridge when possible to get good results. At extreme low water the current becomes too sluggish for accurate measurement, and the lowest measurements are made by wading or from a boat at swifter sections near by. The minimum flow is especially low per square mile of drainage area, and the rating at this stage is liable to considerable change. The right bank will not overflow. The left bank overflows only under the bridge.

Daily gage height, in feet, of Black Warrior River near Cordova, Ala., for 1910.

[Don Smith and C. R. Jones, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	−0.1	0.6	9.8	0.1	−0.1	0.7	3.8	1.1	−0.3	−0.5	−0.5	−0.6
2	− .1	.5	9.5	.05	− .15	.5	5.9	.8	.0	− .5	− .5	− .6
3	− .1	.45	10.0	.05	.2	.3	5.3	.5	.5	− .6	− .5	− .6
4	− .15	.45	6.6	.0	.6	.2	5.1	.5	.0	− .6	− .6	− .5
5	− .15	.4	4.9	.05	.3	.1	6.2	.6	− .1	− .6	− .6	.4
6	.5	.4	4.1	.3	.05	.8	6.9	.8	− .2	− .7	− .5	3.5
7	11.1	.4	3.3	.2	− .1	1.5	10.5	3.8	− .2	1.1	− .5	5.8
8	8.5	.35	2.7	.15	.2	.9	9.8	5.3	− .4	.5	− .5	2.7
9	4.8	.35	2.2	.1	.7	.35	7.3	2.6	− .6	.5	− .6	1.1
10	3.75	.35	1.8	.05	.35	1.6	6.4	2.1	− .7	.4	− .6	.7
11	3.0	.3	3.4	.05	.15	7.8	5.3	1.3	− .7	.4	− .6	.5
12	2.3	.4	3.1	.0	.0	4.3	4.1	.8	− .7	.3	− .6	.4
13	1.7	.8	2.2	.0	− .1	3.8	3.15	.7	− .8	.3	− .6	.3
14	1.3	.5	1.9	.0	− .2	3.2	3.6	.7	− .8	1.5	− .6	.3
15	1.0	.4	1.5	− .05	− .25	2.6	3.9	.6	− .9	2.4	− .7	.2
16	.8	.3	1.3	.0	.0	2.0	2.1	.3	− .9	2.3	− .7	.1
17	.7	.5	1.1	1.3	.8	1.5	2.8	.0	− .9	1.0	− .7	.0
18	.6	13.4	1.0	2.0	.4	1.1	3.3	− .2	− .95	.7	− .7	− .1
19	1.2	11.5	.9	1.5	.0	.7	4.2	− .3	− .95	.0	− .7	− .2
20	.8	6.8	.8	1.0	− .1	.4	3.7	− .4	−1.0	− .2	− .7	− .2
21	2.5	5.0	.7	.7	.5	2.7	3.1	− .3	−1.0	− .4	− .7	− .3
22	5.0	5.6	.6	.5	7.2	3.5	2.8	− .4	−1.0	− .5	− .7	− .3
23	3.7	4.9	.55	.4	8.6	3.6	1.7	− .4	−1.0	− .5	− .7	− .3
24	2.8	4.4	.5	.3	6.1	2.0	.7	− .4	− .7	− .6	− .7	.0
25	2.2	4.3	.45	.2	6.6	1.3	.9	− .4	− .4	− .6	− .7	.9
26	1.7	4.0	.4	.1	8.0	1.6	1.4	− .5	− .5	− .6	− .7	.8
27	1.5	3.5	.35	.05	4.7	1.2	1.0	− .5	− .6	− .7	− .7	.6
28	1.3	6.5	.3	.0	3.0	1.6	.7	− .5	− .7	− .3	− .5	.5
29	1.1	.....	.25	− .05	2.1	1.9	.7	− .5	− .6	− .4	− .5	.5
30	.9	.....	.2	− .05	1.5	2.6	.4	− .5	− .5	− .4	− .5	.5
31	.75	.....	.15	.....	1.0	.....	1.3	− .3	.....	− .4	.....	.4

BLACK WARRIOR RIVER NEAR COAL, ALA.

This station, which was established September 2, 1908, is located one-fourth mile below the mouth of Locust Fork of Black Warrior River, near the foot of the rapids known as Fork Shoals. It is one-half mile above Taylors Ferry, which is 3 miles from Coal and 20 miles from Bessemer, Ala., the nearest railroad station. The gage heights and discharge measurements have been furnished by the Tennessee Coal, Iron & Railroad Co.

The vertical staff gage is located at Taylors Ferry, one-half mile below the measuring section. The left bank is high and does not overflow. The right bank overflows for about 200 feet at high stages. An excellent rating has been developed. No measurements were made in 1910, but the 1909 ratings appear to be permanent enough to apply for 1910.

Daily gage height, in feet, of Black Warrior River near Coal, Ala., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
1	1.65	2.5	9.4	1.9	1.7	16	2.65	2.55	3.0	1.7	1.4
2	1.6	2.5	9.3	1.9	1.7	17	2.45	2.8	3.0	2.1	2.1
3	1.6	2.4	9.55	1.8	1.7	18	2.4	10.05	3.0	3.45	2.85
4	1.55	2.4	7.75	1.8	1.6	19	2.4	10.35	2.9	4.0	2.0
5	1.5	2.4	6.25	1.9	2.25	20	2.7	7.25	3.3	3.55	2.6
6	7.5	2.3	5.5	1.9	2.5	21	4.1	6.3	3.7	3.05	5.9
7	11.0	2.15	4.95	2.0	2.4	22	5.75	7.0	3.55	2.55	9.7
8	9.25	2.0	4.45	2.0	2.4	23	5.45	6.5	2.5	2.25	9.15
9	6.0	2.0	4.05	2.0	2.3	24	4.35	6.1	2.4	2.2	7.7
10	4.85	2.0	4.0	2.0	2.2	25	3.75	5.85	2.3	2.1	8.05
11	4.0	2.0	4.8	1.9	2.1	26	3.55	5.4	2.3	2.0	8.25
12	3.55	2.35	4.95	1.9	2.0	27	3.4	4.95	2.2	1.9	6.1
13	3.15	2.8	4.35	1.8	1.7	28	3.4	8.25	2.1	1.8	4.75
14	3.0	2.75	3.9	1.8	1.5	29	3.15	.....	2.0	1.8	4.05
15	2.85	2.55	3.4	1.7	1.4	30	3.05	.....	2.0	1.8	3.45
						31	2.75	.....	1.9	.....	3.05

Daily discharge, in second-feet, of Black Warrior River near Coal, Ala., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
1	1,240	2,570	23,700	1,600	1,310	16	2,840	2,660	3,500	1,310	895
2	1,170	2,570	23,300	1,600	1,310	17	2,480	3,120	3,500	1,910	1,910
3	1,170	2,400	24,300	1,450	1,310	18	2,400	26,300	3,500	4,420	3,220
4	1,100	2,400	17,200	1,450	1,170	19	2,400	27,500	3,310	5,630	1,750
5	1,030	2,400	11,700	1,600	2,150	20	2,930	15,200	4,110	4,640	2,750
6	16,200	2,230	9,420	1,600	2,570	21	5,860	11,800	4,960	3,600	10,600
7	30,100	1,990	7,940	1,750	2,400	22	10,200	14,300	4,640	2,660	24,900
8	23,100	1,750	6,690	1,750	2,400	23	9,280	12,600	2,570	2,150	22,700
9	10,900	1,750	5,740	1,750	2,230	24	6,450	11,200	2,400	2,070	17,000
10	7,680	1,750	5,630	1,750	2,070	25	5,070	10,400	2,230	1,910	18,300
11	5,630	1,750	7,560	1,600	1,910	26	4,640	9,140	2,230	1,750	19,100
12	4,640	2,320	7,940	1,600	1,750	27	4,320	7,940	2,070	1,600	11,200
13	3,800	3,120	6,450	1,450	1,310	28	4,320	19,100	1,910	1,450	7,440
14	3,500	3,020	5,400	1,450	1,030	29	3,800	.....	1,750	1,450	5,740
15	3,220	2,660	4,320	1,310	895	30	3,600	.....	1,750	1,450	4,420
						31	3,020	.....	1,600	.....	3,600

NOTE.—These discharges were obtained from a rating curve which is well defined below 26,100 second-feet.

Monthly discharge of Black Warrior River near Coal, Ala., for 1910.

[Drainage area, 3,560 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	30,100	1,030	6,070	1.71	1.97	A
February	27,500	1,750	7,350	2.06	2.14	A
March	24,300	1,600	6,880	1.93	2.22	A
April	5,630	1,310	2,060	.579	.65	A
May	24,900	895	5,850	1.64	1.89	A

VILLAGE CREEK NEAR MULGA, ALA.

This station, which was established by the Tennessee Coal, Iron & Railroad Co., is located on Village Creek about one-fourth mile below the mouth of Venison Branch, in sec. 7, R. 4 W., T. 17 S., near Mulga, Ala.

The gage consists of a 16-foot rod located on the left bank of the creek. About 200 feet below this point is a runway suspended from a cable across the creek, from which discharge measurements are made.

Discharge measurements and gage heights have been furnished by the Tennessee Coal, Iron & Railroad Co. There may have been a change in the rating during 1910, and as no measurements have been made no estimates are published.

Daily gage height, in feet, of Village Creek near Mulga, Ala., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.4	1.75	1.2	1.1	1.1	2.4	1.2	0.8	1.05	0.7	0.6
2	.....	1.4	1.55	1.2	1.1	1.05	6.7	1.2	.8	.8	.7	.6
3	.....	1.4	2.25	1.2	1.0	.95	4.1	1.15	1.1	.75	.65	.6
4	.....	1.4	2.0	1.2	1.7	.9	4.8	2.6	1.2	.6	.6	2.1
5	.....	1.4	1.75	1.3	1.3	2.4	3.4	1.9	1.25	1.2	.9	2.15
6	.....	1.35	1.8	1.25	1.2	1.65	3.3	2.0	1.25	1.95	.95	2.75
7	.....	1.3	1.5	1.2	1.2	1.3	2.9	2.55	1.0	1.15	.8	1.25
8	.....	1.3	1.25	1.2	1.45	1.2	2.2	2.05	.95	1.1	.8	1.15
9	.....	1.3	1.2	1.1	1.25	1.8	1.9	1.45	.9	1.0	.8	1.0
10	.....	1.2	1.95	1.1	1.2	2.85	2.2	1.75	2.65	.9	.8	1.0
11	.....	1.4	1.85	1.1	1.1	2.35	3.2	1.35	1.2	.9	.75	1.0
12	.....	1.58	1.6	1.7	1.1	2.4	2.7	4.5	1.0	.9	.7	.95
13	.....	1.4	1.55	1.4	1.1	1.5	2.5	2.3	.9	.8	.7	.9
14	1.4	1.3	1.4	1.25	1.05	1.3	3.6	1.65	.95	.8	.6	.8
15	1.4	1.25	1.3	1.25	1.0	1.3	1.1	1.35	.9	.8	.6	.8
16	1.3	1.2	1.3	2.0	1.05	1.2	1.7	1.25	.8	.8	.6	.8
17	1.2	1.32	1.3	2.05	1.05	1.1	1.8	1.2	.8	.8	.6	.75
18	1.3	2.66	1.3	1.5	.95	1.1	6.4	1.2	.8	.8	.6	.9
19	1.4	1.95	1.3	1.4	.95	1.0	1.4	1.15	.8	.8	.6	.8
20	1.4	1.5	1.3	1.35	2.75	1.05	1.2	1.1	.8	.8	.7	.8
21	2.2	1.8	1.3	1.3	2.3	1.1	1.2	1.1	.8	.8	.8	.75
22	1.8	2.25	1.3	1.25	.....	1.1	1.2	1.05	.8	.8	.8	.7
23	1.6	2.0	1.3	1.3	.....	1.15	1.2	1.0	.8	.8	.7	1.0
24	1.6	2.2	1.2	1.3	.....	1.6	3.7	1.0	1.35	.75	.75	.9
25	1.5	1.85	1.2	1.3	1.7	1.15	2.2	1.0	.9	.7	.65	.9
26	1.5	1.75	1.2	1.2	1.45	1.1	1.6	1.0	.8	.6	.6	.8
27	1.5	2.55	1.2	1.15	1.35	1.0	1.4	1.05	.8	.75	.8	.8
28	1.6	3.4	1.2	1.1	1.3	1.0	1.3	.9	.8	.8	2.5	.8
29	1.6	.....	1.2	1.1	1.3	1.55	1.3	.9	.98	.8	1.1	.9
30	1.5	.....	1.2	1.1	1.25	1.3	1.2	.8	.9	.8	.9	1.55
31	1.5	.....	1.2	.....	1.15	.....	1.3	.8	.....	.8	.....	1.15

CAMP BRANCH NEAR ENSLEY, ALA.

Camp Branch is tributary to Village Creek in sec. 16, R. 4 W., T. 17 S., about 5 miles northwest of Ensley, Ala.

The station, established by the Tennessee Coal, Iron & Railroad Co., is located at the weir about 1,000 feet above the steel bridge on the Mulga road, at the mouth of Camp Branch. The weir is built of timbers grouted into the bedrock of the branch. It is a triangular section with 90° angle up to 1.5 feet and rectangular section 5 feet long up to 2 feet. The hook gage is on the right bank about 25 feet from the opening of the weir and about 8 feet from the end of the dam. The weir opening is about 6 feet from the left end of the dam. In order that discharge measurements can be made when water is over the weir a 14-foot gage rod is located above the weir at a point near a foot log, from which meter discharge measurements are made during high water.

The data for this station were furnished by the Tennessee Coal, Iron & Railroad Co.

Daily discharge, in second-feet, of Camp Branch near Ensley, Ala., for 1910.

Day.	Jan.	Feb.	Day.	Jan.	Feb.	Day.	Jan.	Feb.
1	3.05	6.57	11	7.72	7.66	21	28.25	41.40
2	2.77	5.64	12	7.44	7.49	22	16.20	34.75
3	2.32	6.63	13	6.64	7.10	23	11.45	23.25
4	2.22	5.34	14	6.78	6.57	24	9.65	21.10
5	2.48	4.90	15	5.26	6.57	25	8.14	12.85
6	265.00	4.30	16	4.62	6.28	26	7.47	11.56
7	66.60	3.99	17	4.56	128.96	27	6.93	11.45
8	21.10	3.82	18	4.76	66.60	28	10.33	83.20
9	12.20	4.12	19	4.48	28.25	29	8.18	.....
10	9.01	4.21	20	11.91	14.92	30	7.72	.....
						31	7.25	.....

Monthly discharge of Camp Branch near Ensley, Ala., for 1910.

[Drainage area, 7.43 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	265.00	2.22	18.4	2.44	2.81
February	128.96	3.82	20.4	2.74	2.85

PEARL RIVER BASIN.

DESCRIPTION.

Pearl River drains the south-central part of Mississippi. It rises near the center of the State and flows south into Lake Borgne, an arm of the Gulf of Mexico. The basin is about 200 miles long and comprises an area of 8,000 square miles.

Although lying in a low portion of the Coastal Plain, the lands of this basin are generally well elevated above the stream beds. The surface is largely rolling and hilly, with sandy soils underlain by heavy clays, which at many places show in the stream beds. Much of the area was originally covered with the best class of southern forest pine, known as long-leaf yellow-heart pine. Although these forests have been rapidly cut for 10 to 15 years, they are by no means exhausted.

Pearl River has been for many years a logging stream of first importance among southern rivers, although the railroads and tramways now deliver the bulk of the timber directly to the mills.

PEARL RIVER AT JACKSON, MISS.

This station, which is located at the county highway bridge at Jackson, Miss., one-eighth mile above the Alabama & Vicksburg Railway bridge and two blocks east from the end of the South State Street car line, was established June 24, 1901.

Richland Creek enters the river from the east side about 5 miles below the station. The flow is subject to little or no artificial control above or near the station.

The chain gage is attached to the downstream lower chord of the bridge. Its datum has remained the same since the station was established. The gage-height records for 1909 and 1910 were furnished by the United States Weather Bureau.

The channel is somewhat obstructed by old piles and the bed is shifting, causing slight changes in the rating. The right bank is high and does not overflow. The left bank is of cleared ground and overflows for several hundred feet at a stage of about 20 feet.

Two measurements made in 1911 indicate that the 1909 rating will probably apply for 1910.

Daily gage height, in feet, of Pearl River at Jackson, Miss., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.1	3.3	12.6	2.3	4.0	2.7	5.5	2.8	1.9	0.6	0.5	0.8
2	2.7	3.4	12.4	2.2	3.5	2.5	6.1	2.7	1.8	.5	.5	1.0
3	2.5	3.7	12.3	2.4	3.2	2.2	9.0	2.4	1.7	.5	.5	1.2
4	2.3	3.7	12.1	2.3	2.6	1.9	11.0	2.2	1.6	.5	.5	1.4
5	2.1	3.3	11.8	2.2	2.5	3.3	11.5	2.2	1.5	.5	.5	1.3
6	2.5	3.7	11.3	2.1	2.4	6.4	11.5	3.5	1.4	.5	.6	1.2
7	2.9	3.7	10.8	2.0	2.3	6.4	11.6	3.8	1.5	.8	.7	1.2
8	3.0	3.6	10.1	2.1	2.8	6.8	11.8	4.1	1.4	1.0	.8	1.2
9	4.5	3.6	9.4	2.7	2.3	7.5	12.5	3.9	1.3	1.3	.8	1.2
10	5.5	3.5	8.5	3.0	2.1	6.4	12.2	4.2	1.5	1.6	1.2	1.3
11	5.8	3.5	8.5	3.1	2.0	6.2	12.3	4.1	1.7	1.6	1.4	1.3
12	6.1	3.6	7.6	3.0	1.9	5.0	13.1	3.9	1.5	1.4	1.3	1.3
13	6.0	3.4	7.3	3.0	2.0	5.4	12.7	3.5	1.4	1.4	1.1	1.4
14	5.8	3.1	7.0	2.8	2.0	5.8	12.1	3.2	1.3	1.5	.9	1.4
15	5.2	3.6	6.7	2.6	1.9	6.0	11.5	2.9	1.1	1.4	.8	1.4
16	4.6	4.3	6.3	11.6	1.8	6.0	10.5	2.7	1.0	1.4	.7	1.3
17	4.0	4.7	6.0	14.9	1.7	5.7	9.5	2.4	.9	1.5	.7	1.3
18	3.6	5.1	5.6	15.5	1.6	5.4	9.0	2.4	.9	1.4	.8	1.4
19	3.6	5.2	5.0	16.3	1.5	4.8	8.6	2.2	.9	1.7	.7	1.4
20	3.4	7.0	4.6	16.4	1.5	4.5	7.7	2.0	.9	1.6	.6	1.3
21	4.0	7.9	4.2	15.1	2.2	3.8	6.9	2.0	.9	1.4	.6	1.3
22	3.6	9.4	4.0	13.4	2.1	3.5	6.0	1.9	.8	1.3	.5	1.2
23	4.5	10.0	3.7	13.2	2.0	3.3	5.7	2.3	.8	1.1	.6	1.5
24	4.9	11.0	3.5	13.2	2.7	4.2	4.7	2.2	.8	.9	.6	3.0
25	5.0	11.4	3.2	12.4	2.9	4.4	4.2	2.1	.8	.8	.7	3.8
26	5.3	11.7	3.0	10.5	3.3	3.5	3.7	2.3	.7	.7	.6	4.6
27	5.0	11.7	2.8	8.2	3.5	2.7	3.4	2.4	.7	.7	.6	4.9
28	4.8	12.7	2.7	6.4	3.4	3.0	3.1	2.4	.6	.7	.6	4.5
29	4.5	.....	2.6	5.2	3.3	4.2	2.9	2.3	.6	.6	.6	4.4
30	4.1	.....	2.5	4.5	3.0	5.1	2.6	2.0	.6	.6	.7	4.3
31	3.7	.....	2.4	.....	2.9	.....	2.5	1.9	.....	.5	.....	4.1

Daily discharge, in second-feet, of Pearl River at Jackson, Miss., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	910	1,000	6,320	590	1,320	750	2,040	790	450	130	120	160
2	750	1,040	6,200	555	1,090	670	2,360	750	415	120	120	200
3	670	1,180	6,130	630	955	555	4,040	630	380	120	120	240
4	590	1,180	6,000	590	710	450	5,280	555	350	120	120	290
5	520	1,000	5,800	555	670	1,000	5,610	555	320	120	120	265
6	670	1,180	5,480	520	630	2,530	5,610	1,090	290	120	130	240
7	830	1,180	5,160	485	590	2,530	5,680	1,220	320	160	145	240
8	870	1,140	4,700	520	790	2,750	5,800	1,360	290	200	160	240
9	1,540	1,140	4,280	750	590	3,140	6,260	1,270	265	265	160	240
10	2,040	1,090	3,740	870	520	2,530	6,060	1,400	320	350	240	265
11	2,200	1,090	3,740	910	485	2,420	6,130	1,360	380	350	290	265
12	2,360	1,140	3,200	870	450	1,770	6,670	1,270	320	290	265	265
13	2,310	1,040	3,020	870	485	1,980	6,390	1,090	290	290	220	290
14	2,200	910	2,860	790	485	2,200	6,000	955	265	320	180	290
15	1,870	1,140	2,700	710	450	2,310	5,610	830	220	290	160	290
16	1,580	1,450	2,480	5,680	415	2,310	4,960	750	200	290	145	265
17	1,320	1,630	2,310	7,930	380	2,140	4,340	630	180	320	145	265
18	1,140	1,820	2,090	8,350	350	1,980	4,040	630	180	290	160	290
19	1,140	1,870	1,770	8,940	320	1,680	3,800	555	180	380	145	290
20	1,040	2,860	1,580	9,020	320	1,540	3,260	485	180	350	130	265
21	1,320	3,380	1,400	8,070	555	1,220	2,800	485	180	290	130	265
22	1,140	4,280	1,320	6,880	520	1,090	2,310	450	160	265	120	240
23	1,540	4,640	1,180	6,740	485	1,000	2,140	590	160	220	130	320
24	1,720	5,280	1,090	6,740	750	1,400	1,630	555	160	180	130	870
25	1,770	5,540	955	6,200	830	1,500	1,400	520	160	160	145	1,220
26	1,920	5,740	870	4,960	1,000	1,090	1,180	590	145	145	130	1,580
27	1,770	5,740	790	3,560	1,090	750	1,040	630	145	145	130	1,720
28	1,680	6,390	750	2,530	1,040	870	910	630	130	145	130	1,540
29	1,540	.....	710	1,870	1,000	1,400	830	590	130	130	130	1,500
30	1,360	.....	670	1,540	870	1,820	710	485	130	130	145	1,450
31	1,180	.....	630	.....	830	.....	670	450	.....	120	.....	1,360

NOTE.—These discharges were obtained from a fairly well-defined rating curve.

Monthly discharge of Pearl River at Jackson, Miss., for 1910.

[Drainage area, 3,120 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area mile).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,360	520	1,400	0.449	0.52	B
February	6,390	910	2,400	.769	.80	B
March	6,320	630	2,900	.929	1.07	B
April	9,020	485	3,310	1.06	1.18	B
May	1,320	320	677	.217	.25	B
June	3,140	450	1,650	.529	.59	B
July	6,670	670	3,730	1.20	1.38	B
August	1,400	450	779	.250	.29	B
September	450	130	243	.078	.09	C
October	380	120	220	.071	.08	C
November	290	120	153	.049	.05	C
December	1,720	160	555	.178	.21	B
The year	9,020	120	1,490	.478	6.51	

SUMMARY OF DISCHARGE PER SQUARE MILE.

The following summary of discharge per square mile is given to allow ready comparison of relative rates of run-off from different areas in the south Atlantic coast and eastern Gulf of Mexico drainage basins.

It shows in a general way the seasonal distribution of run-off and the effect of snow, ground, surface, and artificial storage. But the most important fact worth noting is the almost entire lack of uniformity or agreement between any two stations. It indicates that the discharge of each stream is a law unto itself and that all projects dependent upon stream flow, if they are to be developed along the safest and most economical lines, must be based on records of stream flow collected with great care over a long series of years as near the location of the project under consideration as possible.

Summary of discharge, in second-feet per square mile, of south Atlantic coast and eastern Gulf of Mexico drainage basins for 1910.

	Drainage area (square miles).	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept	Oct.	Nov.	Dec.	Year.
James River at Buchanan, Va.	2,060	1.46	1.61	1.30	1.15	0.689	4.00	1.27	0.319	0.287	0.272	0.225	0.336	1.07
James River at Cartersville, Va.	6,230	1.20	1.51	1.23	1.29	.722	2.57	1.20	.321	.284	.414	.294	.406	.947
Roanoke River at Roanoke, Va.	388	.644	1.30	.930	.624	.541	3.07	1.41	.420	.451	.407	.249	.358	.861
Wateree River near Camden, S. C.	4,500	.856	1.77	1.42	.571	.802	1.82	.....	.....	.....	.....	.....	.....	.....
Tugaloo River near Madison, S. C.	593	2.72	2.88	3.61	2.24	5.31	4.06	.....	.....	.....	.....	.....	.....	.....
Savannah River at Woodlawn, S. C.	6,600	1.33	2.12	1.92	1.07	1.68	1.59	.....	.....	.....	.....	.....	.....	.....
Tallulah River at Tallulah Falls, Ga.	191	2.56	2.71	3.23	2.34	4.53	3.88	3.57	2.16	2.02	1.66	1.23	1.98	2.66
Broad River (of Georgia) near Carlton, Ga.	762	1.34	1.75	1.61	.925	1.48	1.69	1.88	1.59	2.19	.819	.752	1.08	1.42
Ocmulgee River near Jackson, Ga.	1,400	1.14	2.31	1.96	1.42	1.09	1.13	1.88	.585	.645	.511	.357	.539	1.12
Ocmulgee River at Macon, Ga.	2,420	.963	1.89	2.20	1.36	.764	.798	1.82	.521	.492	.467	.324	.430	.996
Oconee River near Greensboro, Ga.	1,100	1.30	2.08	1.99	1.15	.982	1.53	2.56	.735	.955	.685	.485	.794	1.26
Oconee River at Fraleys Ferry, near Milledgeville, Ga.	2,840	.989	1.79	1.48	.979	.824	1.06	1.61	.518	.684	.627	.437	.644	.964
Oconee River at Dublin, Ga.	4,180	.766	1.85	1.83	.878	.610	1.03	1.83	.385	.512	.526	.309	.514	.914
Chattahoochee River near Norcross, Ga.	1,170	1.60	1.90	1.81	1.56	3.01	2.32	2.17	1.38	1.39	1.09	.872	1.36	1.70
Chattahoochee River at West Point, Ga.	3,300	1.40	1.95	1.62	1.37	1.95	1.52	1.98	1.24	.921	.752	.603	1.00	1.36
Flint River near Woodbury, Ga.	990	1.18	2.65	1.93	1.62	.745	.719	1.54	.612	.484	.376	.404	.525	1.05
Flint River at Albany, Ga.	5,000	.714	1.52	1.49	1.17	.606	.788	1.13	.610	.466	.384	.396	.520	.812
Flint River at Bainbridge, Ga.	7,410	.618	.....	.....	.....	.629	.659	.837	.644	.538	.448	.439	.510	.....
Pea River at Pera, Ala.	1,180	.802	2.14	2.51	1.50	.474	.623	1.68	.603	.372	.274	.390	.574	.992
Conecuh River at Beek, Ala.	1,290	.661	1.77	1.50	1.72	.488	.938	1.84	.552	.282	.291	.354	.484	.899
Oostanaula River at Resaca, Ga.	1,610	1.20	1.71	1.45	1.16	3.52	2.40	2.68	1.22	1.10	.640	.503	1.17	1.57
Coosa River at Riverside, Ala.	7,060	1.17	1.76	1.64	.853	2.59	1.77	2.86	.908	.711	.450	.341	.737	1.32
Alabama River at Selma, Ala.	15,400	1.08	2.01	1.79	1.09	1.38	1.38	2.64	.968	.616	.474	.373	.669	1.20
Etowah River near Ball Ground, Ga.	466	1.59	1.89	1.68	1.50	3.24	2.27	2.12	1.33	1.04	.910	.758	1.42	1.65
Etowah River near Rome, Ga.	1,800	1.31	1.75	1.46	1.05	2.13	1.53	1.69	1.01	.700	.572	.503	.844	1.21
Tallapoosa River at Sturdevant, Ga.	2,500	1.11	2.01	1.69	1.04	.980	.972	2.89	1.14	.484	.480	.400	.780	1.16
Tombigbee River at Columbus, Miss.	4,440	1.15	1.87	.989	.428	.500	.894	2.75	.259	.089	.100	.085	.273	.777
Tombigbee River at Epes, Ala.	8,830	.800	1.16	1.00	.424	.328	.754	1.86	.311	.095	.105	.088	.228	.593
Black Warrior River near Coal, Ala.	3,560	1.71	2.06	1.93	.579	1.64	.....	.....	.....	.....	.....	.....	.....	.....
Camp Branch near Ensley, Ala.	743	2.44	2.74	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pearl River at Jackson, Miss.	3,120	.449	.769	.929	1.06	.217	.529	1.20	.250	.078	.071	.049	.178	.478

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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 283

SURFACE WATER SUPPLY OF THE UNITED STATES

1910

PART III. OHIO RIVER BASIN

PREPARED UNDER THE DIRECTION OF M. O. LEIGHTON

BY

A. H. HORTON, M. R. HALL, AND H. J. JACKSON

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SURFACE WATER SUPPLY OF THE OHIO RIVER BASIN, 1910.

By A. H. Horton, M. R. Hall, and H. J. Jackson.

INTRODUCTION.

AUTHORITY FOR INVESTIGATIONS.

This volume contains results of measurements of the flow of certain streams in the United States. The work was performed by the water-resources branch of the United States Geological Survey, either independently or in cooperation with private or State organizations. The organic law of the Geological Survey (Stat. L., vol. 20, p. 394) contains the following paragraph:

> Provided that this officer [the Director] shall have the direction of the geological survey and the classification of public lands and examination of the geological structures, mineral resources, and products of the national domain.

As water is the most abundant and most valuable of the minerals, the investigation of water resources is authorized under the provision for examining mineral resources. The work has been supported since the fiscal year ending June 30, 1895, by appropriations in successive sundry civil bills passed by Congress under the following item:

> For gauging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources.

The appropriations that have been made for this purpose are as follows:

Annual appropriations for the fiscal year ending June 30—

1895	$12,500
1896	20,000
1897 to 1900, inclusive	50,000
1901 to 1902, inclusive	100,000
1903 to 1906, inclusive	200,000
1907	150,000
1908 to 1910, inclusive	100,000
1911	150,000

SCOPE OF INVESTIGATIONS.

These investigations are not complete nor do they include all the streams that might purposefully be studied. The scope of the work is limited by the appropriations available. The field covered is the

widest and the character of the work is believed to be the best possible under the controlling conditions. The work would undoubtedly have greater scientific importance and ultimately be of more practical value if the money now expended for wide areas were concentrated on a few small drainage basins; but such a course is impossible because general appropriations made by Congress are applicable to all parts of the country. Each part demands its proportionate share of the benefits.

It is essential that records of stream flow shall be kept during a period of years long enough to determine within reasonable limits the entire range of flow from the absolute maximum to the absolute minimum. The length of such a period manifestly differs for different streams. Experience has shown that the records for some streams should cover 5 to 10 years and those for other streams 20 years or even more, the limit being determined by the relative importance of the stream and the relation of the results to other long-time records on adjacent streams.

In the performance of this work an effort is made to reach the highest degree of precision possible with a rational expenditure of time and a judicious expenditure of a small amount of money. In all engineering work there is a point beyond which refinement is needless and wasteful, and this statement applies with especial force to stream-flow measurements. It is confidently believed that the stream-flow data presented in the publications of the Survey are in general sufficiently accurate for all practical purposes. Many of the records are, however, of insufficient length, owing to the unforeseen reduction of appropriations and consequent abandonment of stations. All persons are cautioned to exercise the greatest care in using such incomplete records.

Records have been obtained at nearly 2,000 different points in the United States. The surface water supply of small areas in Seward Peninsula and the Yukon-Tanana region, Alaska, and in Hawaii has also been investigated. During 1910 regular gaging stations were maintained by the Survey and cooperating organizations at about 1,100 points in the United States, and many discharge measurements were made at other points. Data were also obtained in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in the regular surface water supply papers and in special papers from time to time.

PUBLICATIONS.

The data on stream flow collected by the United States Geological Survey have appeared in the annual reports, bulletins, and water-supply papers. Owing to natural processes of evolution and to changes in governmental requirements, the character of the work and the territory covered by these different publications have varied

greatly. For the purpose of uniformity in the presentation of reports a general plan has been agreed upon by the United States Reclamation Service, the United States Forest Service, the United States Weather Bureau, and the United States Geological Survey, according to which the area of the United States has been divided into 12 parts, whose boundaries coincide with certain natural drainage lines. The areas so described are indicated by the following list of papers on surface water supply for 1910. The dividing line between the north Atlantic and south Atlantic drainage areas lies between York and James rivers.

Papers on surface water supply of the United States, 1910.

Part.	No.	Title.
I	281	North Atlantic coast.
II	282	South Atlantic coast and eastern Gulf of Mexico.
III	283	Ohio River basin.
IV	284	St. Lawrence River basin.
V	285	Upper Mississippi River and Hudson Bay basins.
VI	286	Missouri River basin.
VII	287	Lower Mississippi River basin.
VIII	288	Western Gulf of Mexico.
IX	289	Colorado River basin.
X	290	Great Basin.
XI	291	California.
XII	292	North Pacific coast.

The following table gives the character of data regarding stream flow at regular stations to be found in the various publications of the United States Geological Survey, exclusive of special papers:

Stream-flow data in reports of the United States Geological Survey.

[A.=Annual Report; B.=Bulletin; W S.=Water-Supply Paper.]

Report.	Character of data.	Year.
10th A., pt. 2	Descriptive information only	
11th A., pt. 2	Monthly discharge	1884 to Sept., 1890.
12th A., pt. 2	do	1884 to June 30, 1891.
13th A., pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A., pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B. 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A., pt. 2	Descriptive information only	
B. 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
W S. 11	Gage heights (also gage heights for earlier years)	1896.
18th A., pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for earlier years).	1895 and 1896.
W S. 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
W S. 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A., pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
W S. 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.
W S. 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1898.
20th A., pt. 4	Monthly discharge (also for many earlier years)	1898.
W S. 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A., pt. 4	Monthly discharge	1899.
W S. 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A., pt. 4	Monthly discharge	1900.

NOTE.—No data regarding stream flow are given in the 15th and 17th annual reports.

Stream-flow data in reports of the United States Geological Survey—Continued.

Report.	Character of data.	Year.
W S. 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
W S. 75	Monthly discharge	1901.
W S. 82 to 85	Complete data	1902.
W S. 97 to 100	do	1903.
W S. 124 to 135	do	1904.
W S. 165 to 178	do	1905.
W S. 201 to 214	Complete data, except descriptions	1906.
W S. 241 to 252	Complete data	1907–8.
W S. 261 to 272	do	1909.
W S. 281 to 292	do	1910.

The records at most of the stations discussed in these reports extend over a series of years. An index of the reports containing records prior to 1904 has been published in Water-Supply Paper 119.

The first table which follows gives, by years and drainage basins, the numbers of the papers on surface water supply published from 1899 to 1909. Wherever the data for a drainage basin appears in two papers the number of one is placed in parentheses and the portion of the basin covered by that paper is indicated in the second table. For example, in 1904 the data for Missouri River were published in Water-Supply Papers 130 and 131, and the portion of the records contained in Water-Supply Paper 131, as indicated by the second table, is that relating to Platte and Kansas rivers.

Numbers of water-supply papers containing results of stream measurements, 1899-1910.

	1899 [a]	1900 [b]	1901	1902	1903	1904	1905	1906	1907–8	1909	1910
Atlantic coast and eastern Gulf of Mexico:											
New England rivers	35	47	65, 75	82	97	124	165	201	241	261	281
Hudson River to Delaware River, inclusive	35	47, (48)	65, 75	82	97	125	166	202	241	261	281
Susquehanna River to York River, inclusive	35	48	65, 75	82	97	126	167	203	241	261	281
James River to Yadkin River, inclusive	(35), 36	48	65, 75	(82), 83	(97), 98	126	167	203	242	262	282
Santee River to Pearl River, inclusive	36	48	65, 75	83	98	127	168	204	242	262	282
St. Lawrence River	36	49	65, 75	(82), 83	97	129	170	206	244	264	284
Hudson Bay	.....	.....	66, 75	85	100	130	171	207	245	265	285
Mississippi River:											
Ohio River	36	48, (49)	65, 75	83	98	128	169	205	243	263	283
Upper Mississippi River	36	49	65, 75	83	98, (99)	128, (130)	171	207	245	265	285
Missouri River	(36), 37	49, (50)	66, 75	84	99	130, (131)	172	208	246	266	286
Lower Mississippi River	37	50	(65), 66, 75	(83), 84	(98), 99	(128), 131	(169), 173	(205), 209	247	267	287
Western Gulf of Mexico	37	50	66, 75	84	99	132	174	210	248	268	288
Pacific coast and Great Basin:											
Colorado River	(37), 38	50	66, 75	85	100	133, (134)	175, (177)	211, (213)	249, (251)	269, (271)	289, (291)
Great Basin	38, (39)	51	66, 75	85	100	133, (134)	176, (177)	212, (213)	250, (251)	270, (271)	290, (291)
South Pacific coast to Klamath River, inclusive	(38), 39	51	66, 75	85	100	134	177	213	251	271	291
North Pacific coast	38	51	66, 75	85	100	135	(177), 178	214	252	272	292

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39.
[b] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52.

Numbers of water-supply papers containing data covering portions of drainage basins.

No.	River basin.	Tributaries included.
35..	James	
36..	Missouri	Gallatin.
37..	Colorado	Green, Gunnison, Grand above junction with Gunnison.
38..	Sacramento	Except Kings and Kern.
39..	Great Basin	Mohave.
48..	Delaware	Wissahickon and Schuylkill.
49..	Ohio	Scioto.
50..	Missouri	Loup and Platte near Columbus, Nebr. All tributaries below junction with Platte.
65..	Lower Mississippi	Yazoo.
82..	James	
	St. Lawrence	Lake Ontario, tributaries to St. Lawrence River proper.
83..	Lower Mississippi	Yazoo.
97..	James	
98..	Lower Mississippi	Do.
99..	Upper Mississippi	Tributaries from the west.
128.	Lower Mississippi	Yazoo.
130.	Upper Mississippi	Tributaries from the west.
131.	Missouri	Platte, Kansas.
134.	Colorado	Data near Yuma, Ariz., repeated.
	Great Basin	Susan, Owens, Mohave.
169.	Lower Mississippi	Yazoo.
177.	Colorado	Below junction with Gila.
	Great Basin	Susan repeated, Owens, Mohave.
	North Pacific coast	Rogue, Umpqua, Siletz.
205.	Lower Mississippi	Yazoo, Homochitto.
213.	Colorado	Data at Hardyville repeated; at Yuma, Salton Sea.
	Great Basin	Owens, Mohave.
251.	Colorado	Yuma and Salton Sea stations repeated.
271.	Great Basin	Owens River basin.

The order of treatment of stations in any basin in these papers is downstream. The main stem of any river is determined by measuring or estimating the drainage area; that is, the headwater stream having the largest drainage area is considered the continuation of the main stream and local changes in name and lake surface are disregarded. Records for all stations from the source to the mouth of the main stem of the river are presented first, and records for the tributaries in regular order from source to mouth follow, all records for each tributary basin being given before those of the next basin below.

The exceptions to this rule occur in the records for Mississippi River, which are given in four parts, as indicated above, and in the records for large lakes, where it is simpler to take up the streams in regular order around the rim of the lake than to cross back and forth over the lake surface.

DEFINITION OF TERMS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in several terms, each of which has become associated with a certain class of work. These terms may be divided into two groups—(1) those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and run-off in second-feet per square mile, and (2) those which represent the actual quantity of water, as run-off in depth in inches and acre-feet. The units used in this series of reports are second-feet, second-feet per square mile, and run-off in inches and acre-feet. They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second and is the unit for the rate of discharge of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed by the use of the factors given in the following table of equivalents.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

An "acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation work.

CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:

1 second-foot equals 40 California miner's inches (law of Mar. 23, 1901).
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.
1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.
1 second-foot equals 6.23 British imperial gallons per second.
1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day covers 1 square mile 0.03719 inch deep.
1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
1 second foot for one 31-day month covers 1 square mile 1.153 inches deep.
1 second-foot for one day equals 1.983 acre-feet.
1 second-foot for one 28-day month equals 55.54 acre-feet.
1 second-foot for one 29-day month equals 57.52 acre-feet.
1 second-foot for one 30-day month equals 59.50 acre-feet.
1 second-foot for one 31-day month equals 61.49 acre-feet.
100 California miner's inches equals 18.7 United States gallons per second.
100 California miner's inches equals 96 Colorado miner's inches.
100 California miner's inches for one day equals 4.96 acre-feet.
100 Colorado miner's inches equals 2.60 second-feet.
100 Colorado miner's inches equals 19.5 United States gallons per second.
100 Colorado miner's inches equals 104 California miner's inches.
100 Colorado miner's inches for one day equals 5.17 acre-feet.
100 United States gallons per minute equals 0.223 second-foot.
100 United States gallons per minute for one day equals 0.442 acre-foot.
1,000,000 United States gallons per day equals 1.55 second-feet.

1,000,000 United States gallons equals 3.07 acre-feet.
1,000,000 cubic feet equals 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
$1\frac{1}{3}$ horsepower equals about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of theoretical power.

EXPLANATION OF DATA.

For each drainage basin there is given a brief general description covering such items as area, source, tributaries, topography, geology, forestation, rainfall, irrigation, storage, power, and other interesting or important facts.

For each regular current-meter gaging station the following data so far as available are given: Description of station, list of discharge measurements, table of daily gage heights, table of daily discharges, table of monthly and yearly discharges and run-off. For stations located at weirs or dams the gage-height table is omitted.

In addition to statements regarding the location and installation of current-meter stations the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such points as ice, logging, shifting channels, and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the accuracy and reliability of the data.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of hydrographer, width and area of cross section, gage height, and discharge in second-feet.

The table of daily gage heights records the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day. At most stations the gage is read in the morning and in the evening. The gage height given in the table represents

the elevation of the surface of the water above the zero of the gage. All gage heights affected by the presence of ice in the streams or by backwater from obstructions are published as recorded, with suitable footnotes. The rating table is not applicable for such periods unless the proper corrections to the gage heights are known and applied. Attention is called to the fact that the zero of the gage is placed at an arbitrary datum and has no relation to zero flow or the bottom of the river. In general, the zero is located somewhat below the lowest known flow, so that negative readings shall not occur.

The discharge measurements and gage heights are the base data from which rating tables, daily discharge tables, and monthly discharge tables are computed.

The rating table gives, either directly or by interpolation, the discharge in second-feet corresponding to every stage of the river recorded during the period for which it is applicable. It is not published in this report, but can be determined from the daily gage heights and daily discharges for the purpose of verifying the published results as follows:

First plot the discharge measurements for the current and earlier years on cross-section paper, with gage heights in feet as ordinates and discharge in second-feet as abscissas. Then tabulate a number of gage heights taken from the daily gage-height table for the complete range of stage given and the corresponding discharges for the days selected from the daily discharge table and plot the values on cross-section paper. The last points plotted will define the rating curve used and will lie among the plotted discharge measurements. After drawing the rating curve, a table can be developed by scaling off the discharge in second-feet for each tenth foot of gage height. These values should be so adjusted that the first differences shall always be increasing or constant, except for known backwater conditions.

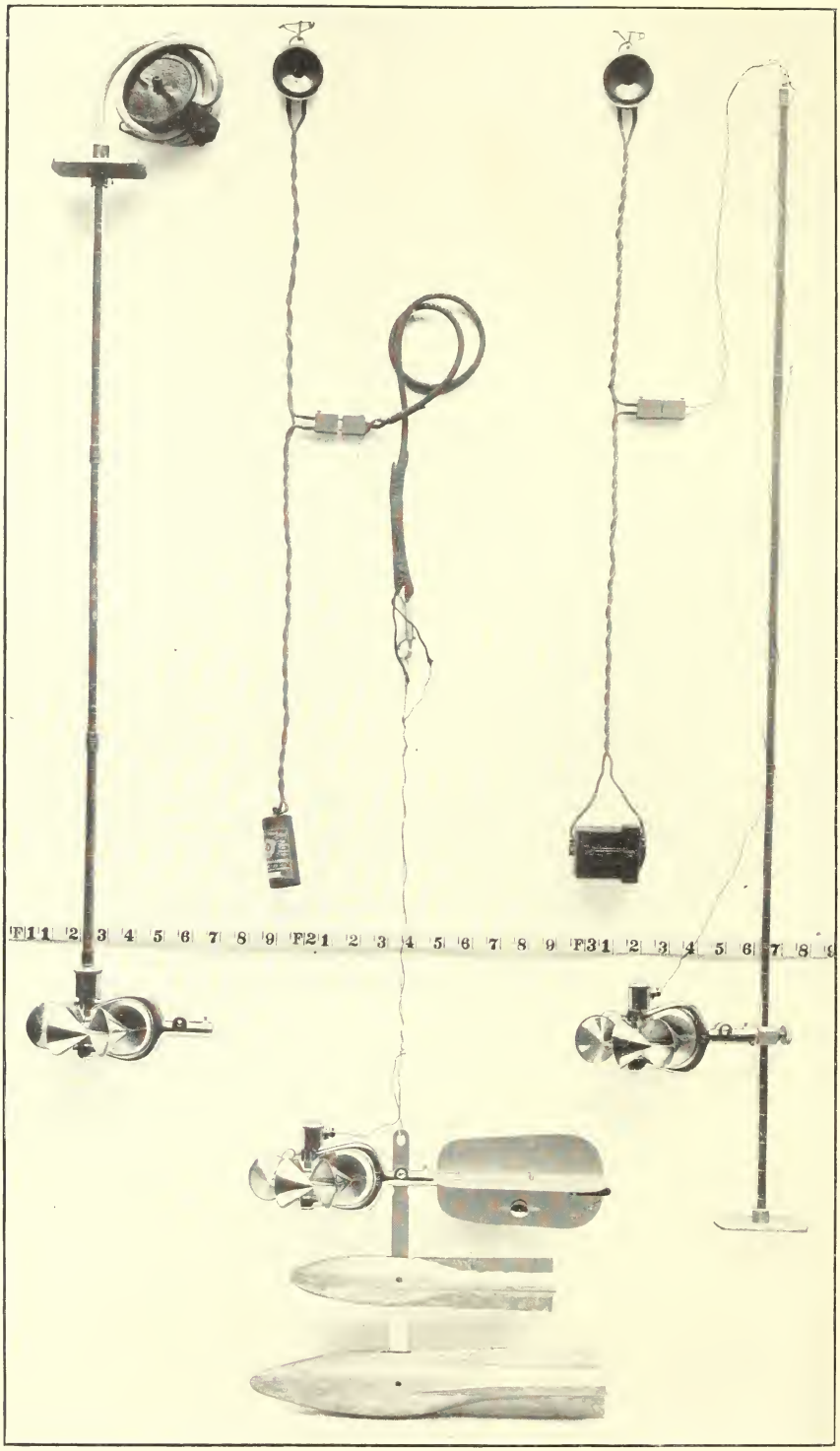
The table of daily discharges gives the discharges in second-feet corresponding to the observed gage heights as determined from the rating tables.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height, and the corresponding discharge was consequently larger than given in the maximum column. Likewise, in the column of "Minimum," the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this the computations for the remaining columns, which are defined on pages 11 and 12, are based.

A. FOR BRIDGE MEASUREMENT.

B. FOR WADING MEASUREMENT.

TYPICAL GAGING STATIONS.



SMALL PRICE CURRENT METERS.

The field methods used in the collection of the data presented in this series of reports are described in the introductory sections of Water-Supply Papers 261 to 272, inclusive, "Surface water supply of the United States, 1909." Plate I shows typical gaging stations, indicating the method of suspending the current meter; Plate II shows the various types of current meters [1] used in the work.

ACCURACY AND RELIABILITY OF FIELD DATA AND COMPARATIVE RESULTS.

The accuracy of stream flow depends primarily on the natural conditions at the gaging station and on the methods and care with which the data are collected. Errors of the first group depend on the degree of permanency of channel and of permanency of the relation of discharge to stage. Errors of the second group are due, first, to errors in observation of stage; second, to errors in measurements of flow; and, third, to errors due to misinterpretation of stage and flow data.

Practically all discharge measurements made under fair conditions are well within 5 per cent of the true discharge at the time of observation. Inasmuch as the errors of meter measurements are largely compensating, the mean rating curve, when well defined, is much more accurate than the individual measurements. Numerous experiments made to test the accuracy of current-meter work show that it compares very favorably with the results from standard weirs and, owing to simplicity of methods, usually gives results that are much more reliable than those from stations at dams where the coefficient may be uncertain and conditions of flow are complicated.

The work is, of course, dependent on the reliability of the gage observers. With relatively few exceptions, the observers perform their work honestly. The records are, however, closely watched and the cause of any discrepancy is investigated. It is obvious that one gage reading a day does not always give the mean height for that day. As an almost invariable rule, however, errors from this source are compensating and virtually negligible in a period of one month, although a single day's reading may, when taken by itself, be considerably in error.

An effort is made to visit every station at least once each year for the purpose of making a measurement to determine the constancy of conditions of flow since the last measurement made in the preceding year, and also to check the elevation of the gage. On account of lack of funds or for other causes some stations were not visited during the current year. If conditions of flow have been reasonably permanent up to the time of the last preceding measurement, it is con-

[1] See Hoyt, J. C., and others, Use and care of the current meter as practiced by the United States Geological Survey; Trans. Am. Soc. Civil Eng., vol. 66, 1910, p. 70.

sidered best to publish estimates of discharge based on the latest verified rating curve rather than to omit them altogether, although it should be distinctly understood that such records are at times subject to considerable error. This is also true, although to a less degree, of the period of records since the date of the last measurement of the current year. As a rule, the accuracy notes are based on the assumption that the rating curve used is strictly applicable to the current year.

In order to give engineers and others information regarding the probable accuracy of the computed results, footnotes are added to the daily-discharge tables, stating the probable accuracy of the rating tables used, and an accuracy column is inserted in the monthly-discharge table. For the rating tables "well defined" indicates, in general, that the rating is probably accurate within 5 per cent; "fairly well defined," within 10 per cent; "poorly defined" or "approximate," within 15 to 25 per cent. These notes are very general and are based on the plotting of the individual measurements with reference to the mean rating curve.

The accuracy column in the monthly-discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean. It is based on the accuracy of the rating, the probable reliability of the observer, and knowledge of local conditions. In this column A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

USE OF THE DATA.

In general the base data which are collected in the field each year by the Survey engineers are published, not only to comply with the law, but also for the express purpose of giving to any engineer the opportunity of examining the computed results and of changing and adjusting them as may seem best to him. Although it is believed that the rating tables and computed monthly discharges are as good as the base data up to and including the current year will warrant, it should always be borne in mind that the additional data collected at each station from year to year nearly always throw new light on data already collected and published, and hence allow more or less improvement in the computed results of earlier years. It is therefore expected that the engineer who makes use of the figures presented in these papers will verify all ratings and make such adjustments for earlier years as may seem necessary. The work of compiling, studying, revising, and republishing data for different drainage basins for 5 or 10 year periods or more is carried on by the United States Geological Survey so far as the funds for such work are available.

The estimates in the table of monthly discharge are so arranged as to give only a general idea of the conditions of flow at the station, and it is not expected that they will be used for other than preliminary estimates.

The daily discharges are published to allow a more detailed study of the variation in flow and to determine the periods of deficient flow.

COOPERATIVE DATA.

Cooperative data of various kinds and data regarding the run-off at many stations maintained wholly by private funds are incorporated in the surface water-supply reports of the United States Geological Survey.

Many stations throughout the country are maintained for specific purposes by private parties who supply the records gratuitously to the United States Geological Survey for publication. When such records are furnished by responsible parties and appear to be reasonably accurate, they are verified, so far as possible, and estimated values of accuracy are given. Records clearly worthless or misleading are not published. As it is, however, impossible to completely verify all such records furnished—because of lack of funds or for other causes—they are published for what they are worth, as they are of value as a matter of record and afford at least approximate information regarding stream flow at the particular localities. The Survey does not, however, assume any responsibility for inaccuracies found in such records, although most of them are believed to be reasonably good.

COOPERATION AND ACKNOWLEDGMENTS.

For assistance rendered and records furnished special acknowledgment is due to members of the United States Corps of Engineers, the United States Weather Bureau, the Water Supply Commission of Pennsylvania, the North Carolina Geological Survey, the Ohio State Experiment Station, the Kentucky Geological Survey, the Madison Electric & Power Co., of Richmond, Ky., and F. W. Scheidenhelm. The State of Illinois has paid for the stream-gaging work in that State, the appropriation therefor being in charge of the Internal Improvement Commission, Isham Randolph, chairman.

DIVISION OF WORK.

The field data for Allegheny River at Red House, N. Y., have been collected under the direction of C. C. Covert, district engineer, assisted by W. G. Hoyt.

The field data for the Ohio River basin, with the exception of Allegheny River at Red House, N. Y., and for a portion of the Tennessee

River drainage basin have been collected under the direction of A. H. Horton, district engineer, assisted by H. J. Jackson, C. T. Bailey, M. E. McChristy, J. C. Dort, P. S. Monk, and R. A. Hanson. Stations in Pennsylvania are now maintained and the stream-flow data collected by the Water Supply Commission of Pennsylvania.

The field data in the Tennessee River basin have been collected under the direction of M. R. Hall, district engineer, assisted by F. P. Thomas.

The ratings, special estimates, and studies of the completed data were made by A. H. Horton, M. R. Hall, R. H. Bolster, and H. J. Jackson. The computations were made and the completed data prepared for publication under the direction of R. H. Bolster and H. J. Jackson by G. C. Stevens, H. J. Jackson, J. G. Mathers, H. D. Padgett, G. K. Larrison, A. H. Tuttle, H. J. Dean, O. de Carre, A. McMillan, and M. I. Walters. The report has been edited by Mrs. B. D. Wood.

GENERAL FEATURES OF OHIO RIVER DRAINAGE BASIN.

The drainage basin of Ohio River lies in the central part of the eastern half of the United States. The river is formed by the union of Allegheny and Monongahela rivers at Pittsburgh, Pa., and flows in a general southwesterly direction to its junction with the Mississippi at Cairo, Ill. The principal tributaries below Pittsburgh from the north and west are Beaver, Muskingum, Scioto, Miami, and Wabash rivers; those from the south and east are Monongahela, Little Kanawha, Kanawha, Guyandotte, Big Sandy, Licking, Kentucky, Green, Cumberland, and Tennessee rivers. The total length of the river is 967 miles; the total drainage area is about 210,000 square miles.

The drainage basin of Ohio River comprises greater or less areas in the States of New York, Pennsylvania, Maryland, West Virginia, Virginia, North Carolina, Georgia, Alabama, Tennessee, Kentucky, Ohio, Indiana, and Illinois. Its northern boundaries are about 40 miles south of Buffalo, N. Y., its southern boundaries are within 300 miles of the Gulf of Mexico, and its eastern boundaries are about 225 miles from the Atlantic Ocean. The sources of the tributaries from the north lie in the glaciated area; those of the southern tributaries are located on the steep and rocky slopes of the western side of the Appalachian Mountains.

The topography of the basin varies from flat and rolling in the western and northern portions to rough and mountainous in the southern and eastern sections. In general the rock floor of the valley is 30 to 50 feet below the level of the stream at low water. Between Evansville, Ind., and Shawneetown, Ill., its level is 65 or 75 feet

below the stream. It is thought that in the whole length of the valley no rock barrier crosses its entire width at a level as high as the bed of the present stream. In several places rock shelves extend out part way across the river bed, leaving a channel deep enough for the passage of boats along the opposite bank. At Letart Falls the rock dips toward the east bank sufficiently to allow boats to pass when the rock of the western part of the stream bed is above the water surface. Well data indicate that this descent continues eastward beneath the bottom lands to a level as low as in the neighboring parts of the channel. Near Ravenswood, W. Va., rocky reefs are exposed at low water fully halfway across the stream bed, but wells on the bottom lands near the village show the rock floor to be at least 25 feet below the stream at low water. At Louisville wells and bridge soundings indicate that a channel 25 feet or more lower than the present surface at the head of the rapids leads southwestward from near the south end of the Jeffersonville bridge a short distance and then turns westward, passing through the city. Thus a buried channel apparently occurs at the side of each of the three most conspicuous rock reefs touched by the stream.

Notwithstanding the great number of riffles and shoals, the Ohio is generally navigable throughout the entire season for boats drawing less than 3 feet of water. It is navigable for vessels drawing 6 feet of water during a few months of the early part of the season, but there is usually little traffic with such boats after July. The canal at Louisville affords opportunity for passing around the rapids during low water. During high-water stages the boats are able to pass over the rapids.

The narrowness of the valley of Ohio River has been a subject of remark from the early days of settlement. At very few places between Pittsburgh and Louisville does its width exceed 2 miles, and usually it is scarcely more than 1 mile wide. In the vicinity of Louisville its width is perhaps 4 miles, but below the mouth of Salt River it narrows abruptly to about 1 mile, and remains narrow for nearly 100 miles. Beyond this narrow stretch it broadens out to a width of 6 or 8 miles, which it maintains for much of its course to Cairo, the only exception as it passes the elevated ridge below Shawneetown, where its width is reduced to about 2½ miles.

The depth of the valley ranges from about 600 feet down to scarcely 100 feet, being greatest on the border of the "panhandle" of West Virginia and least in the lower portion of its course. Its depth seldom falls below 300 feet in the portion above Louisville and probably averages 450 feet. The narrow portion below Louisville is about 300 feet deep. The broad portions at Louisville and in the lower parts of its course are but 100 to 150 feet deep. The work of the river in

excavating its narrow valley through the elevated districts is apparently commensurate with that accomplished in eroding the wide valley in the low districts, but the stream has accomplished less than it should have in the time since the beginning of development of the drainage lines—far less in proportion to its size than has been achieved by the small tributaries that enter it from southern Indiana. The explanation of this meager amount of work is found in the enlargement of Ohio River in recent times. Investigations now in progress indicate that several independent drainage lines which formerly led northward from the Appalachian Mountains across southwestern New York, northwestern Pennsylvania, and Ohio into the Lake Erie Basin have been united to form the present Ohio. The full extent of these changes is not yet determined, nor have all of the outlets for the old river systems been satisfactorily traced; but enough is known to justify the statement that the small size of the valley of the Ohio is attributable to the geologically recent union of the several independent drainage systems.

Between Pittsburgh and Wheeling the bed of the river is composed of coarse gravel and bowlders and in places rock. Below Wheeling the gravel becomes finer, the bowlders are fewer, and bars of river sand appear. Below the mouth of the Kanawha the bed of the river becomes more distinctively sandy, although there are some gravel bars above Louisville.

The average width between banks does not increase materially from Pittsburgh to Cincinnati. In the long pool above the falls of the Ohio at Louisville the average width is much greater than that above Cincinnati, while just below the falls there is a considerable narrowing. Below this the average width continues to increase toward the mouth of the river. The maximum width between banks is found about 20 miles above the mouth, where it is considerably more than a mile. There are many islands in the river—more than 50 above Louisville and about 30 below—ranging in size from a few acres to 5,000 acres. Many of them are cultivated and all are practically permanent in position.

The river presents an interesting series of shoals and riffles separated by pools in which the water is deeper and the fall very low. The summary of the profile made by the Army engineers shows 187 pools with over 7 feet depth at low water, extending over 632.5 miles. Of these pools 127 are above Louisville and 60 are below Louisville.

On the borders of Ohio the riffles (103 in number) cover an aggregate length of 137 miles and have a total fall of 170 feet. The pools with a length of 309 miles, have a fall of 64 feet, or but 2.5 inches to the mile. The greatest fall noted for a single mile on the border of Ohio is 3.2 feet at Letart Falls, Meigs County. There are 11 riffles

with a descent exceeding 2 feet to the mile. The least fall reported is 8 to 15 miles below Cincinnati, where a pool 7 miles long has a fall of but 3.5 inches; and another pool with a fall about as low is 23 to 30 miles above Cincinnati. These two are the most conspicuous pools in this section of the Ohio.

On the borders of Indiana, aside from the Louisville rapids, there are 55 riffles showing a total fall of 80.28 feet in stretches aggregating 134.5 miles. At the Louisville rapids there is a fall of 23.09 feet in 2.25 miles. There is left but 18.13 feet for the fall of the stream in about 215 miles embraced in the pools, or only 1 inch to the mile. The elevation of normal low water at Davis Island Dam at Pittsburgh is 692 feet, and low-water elevation at Cairo is 273 feet—a total fall of 419 feet, or an average fall of about 0.43 feet to the mile.

The northern and western portions of the drainage basin is deforested; the southern and eastern portions may be called partly forested, as large areas in the Appalachian Mountains at the sources of some of the southern tributaries are still covered with a heavy growth of trees; as the tributaries are descended the cleared areas increase until the forested area is small.

The mean annual rainfall in the basin is about 45 inches, ranging from 35 inches along its northern boundary to 70 inches in the southeastern part at the sources of Tennessee River. The winters in general are mild; ice does not form very thick—on some tributaries hardly at all; the snowfall is light and does not last long. In the region about the headwaters of Allegheny River, however, the winters are severe.

The basin affords many opportunities for storage, especially on the southern tributaries. From topographic maps covering part of the drainage area of the Ohio a large number of reservoir sites were located, some of them of enormous capacity. Careful surveys would undoubtedly show many suitable sites for dams that would impound large reservoirs above them.

In quantity of discharge Ohio River is the main tributary of the Mississippi. Its mean annual discharge is about 300,000 cubic feet per second, which is much more than the discharge of St. Lawrence River at Ogdensburg, N. Y., although the drainage area of the St. Lawrence is nearly twice that of the Ohio. The maximum flow of the Ohio is approximately 1,500,000 cubic feet per second—about 30 times the low-water flow. A comparison of records of flow of Ohio River with those of the upper Mississippi and Missouri shows that although its drainage area is one-third that of the combined Mississippi and Missouri its mean and low water flow is 1.3 times as great as their combined flow, and its maximum flow is 1.5 times as great. This fact is accounted for by the greater rainfall in the Ohio Basin and by the general character of the region.

Navigation in the Ohio is stopped not only by low stages of the river but also occasionally by ice for periods averaging 10 to 12 days a year. Sometimes the ice forms and passes off without occasioning great loss; sometimes there may be more than one serious break-up during the same winter.

The United States Weather Bureau and the Army Engineer Corps have maintained a number of gages on Ohio River at various places. Measurements of the discharge of the river have been made by the engineers of the United States Geological Survey at a number of places where gages are located.

GAGING STATIONS MAINTAINED IN OHIO RIVER BASIN.

The following list comprises the gaging stations maintained in Ohio River basin by the United States Geological Survey and cooperative parties. The stations are arranged by river basins, in downstream order, as explained on page 11, tributaries being indicated by indention. Data for these stations have been published in the reports listed in tables on pages 9 to 11.

Allegheny River (head of Ohio River) at Red House, N. Y., 1903–1910.
Allegheny River at Kittanning, Pa., 1904–1910.
    Conewango Creek—
        Chautauqua Lake outlet (Chadakoin River) near Jamestown, N. Y., 1895.
        Chadakoin River near Jamestown, N. Y., 1904–5.
    Kiskiminitas River near Avonmore, Pa., 1907–1910.
    Kiskiminitas River at Salina, Pa., 1904–1906.
        Blacklick Creek at Blacklick, Pa., 1904–1910.
    Tygart River (head of Monongahela River) at Belington, W. Va., 1907–1910.
    Tygart River at Fetterman, W. Va., 1907–1910.
Monongahela River at Lock No. 4, Pa., 1886–1906. Flood stage record only.
    Buckhannon River at Hall, W. Va., 1907–1909.
    West Fork River at Enterprise, W. Va., 1907–1910.
    Buffalo Creek at Barrackville, W. Va., 1907–8.
    Cheat River at Morgantown, W. Va., 1899–1900; 1902–1905; 1908–1910.
    Youghiogheny River at Friendsville, Md., 1898–1904.
    Youghiogheny River at Confluence, Pa., 1904–1909.
        Casselman River at Confluence, Pa., 1904–1910.
        Laurel Hill Creek at Confluence, Pa., 1904–1910.
        Indian Creek in Westmoreland County, Pa., 1892–3.
Beaver River—
    Mahoning River at Youngstown, Ohio, 1903–1906.
Cross Creek near Mingo Junction, Ohio, 1903.
McMahon River at Steel, Ohio, 1903.
Muskingum River at Zanesville, Ohio, 1905–1910.
    Mohican River at Pomerene, Ohio, 1910.
        Licking River at Pleasant Valley, Ohio, 1902–1906.
        Jonathan Creek at Powells, Ohio, 1902–3.
Kanawha River—
    New River (South Fork) (head of Kanawha River) at New River, N. C., 1900–1901.
    New River (South Fork) near Crumpler, N. C., 1908–1910.

New River at Oldtown, Va., 1900–1903.
New River near Grayson, Va., 1908–1910.
New River at Radford, Va., 1898–1910.
New River at Fayette, W. Va., 1895–1904; 1908–1910.
New River (North Fork) at Weaversford, N. C., 1900–1901.
New River (North Fork) near Crumpler, N. C., 1908–1910.
Reed Creek at Grahams Forge, Va., 1908–1910.
Big Reed Island Creek near Allisonia, Va., 1908–1910.
Little River near Copper Valley, Va., 1908–1910.
Walker Creek at Staffordsville, Va., 1908–1910.
Wolf Creek near Narrows, Va., 1908–1910.
Bluestone River at Lilly, W. Va., 1908–1910.
Greenbrier River near Marlinton, W. Va., 1908–1910.
Greenbrier River at Alderson, W. Va., 1895–1906; 1907–1910.
Gauley River at Allingdale, W. Va., 1908–1910.
Gauley River near Summersville, W. Va., 1908–1910.
Gauley River at Belva, W. Va., 1908–1910.
Cherry River at Richwood, W. Va., 1908–1910.
Meadow River near Russellville, W. Va., 1908–1910.
Elk River at Webster Springs, W. Va., 1908–1910.
Elk River at Gassaway, W. Va., 1908–1910.
Elk River at Clendennin, W. Va., 1908–1910.
Coal River at Brushton, W. Va., 1908–1910.
Coal River at Tornado, W. Va., 1908–1910.
Pocotaligo River at Sissonville, W. Va., 1908–1910.
Scioto River near Columbus, Ohio, 1903–1906.
Olentangy River near Columbus, Ohio, 1903–1905.
Miami River—
Little Miami River at Loveland, Ohio, 1906.
Little Miami River near Morrow, Ohio, 1903.
Miami River at Hamilton, Ohio, 1910.
Miami River at Dayton, Ohio, 1905–1909.
Mad River near Springfield, Ohio, 1904–1906.
Kentucky River at Frankfort, Ky., 1905–6.
Dix River near Danville, Ky., 1905.
Dix River near Burgin, Ky., 1910.
Salt River (Rolling Fork) at New Haven, Ky., 1905–6.
Wabash River at Logansport, Ind., 1903–1906.
Wabash River at La Fayette, Ind., 1901–1903.
Wabash River at Terre Haute, Ind., 1902–3 and 1905–6.
Wabash River at Mount Carmel, Ind., 1884–1910 (gage-height records by United States Weather Bureau).
Tippecanoe River at Delphi, Ind., 1903–1906; 1908.
Embarrass River near Oakland, Ill., 1909–10.
Embarrass River at St. Marie, Ill., 1909–10.
West Branch of White River at Indianapolis, Ind., 1904–1906.
Eel River at Cataract, Ind., 1903–1906.
East Branch of White River at Shoals, Ind., 1903–1906; 1909–10.
Little Wabash River at Clay City, Ill., 1909–10.
Little Wabash River at Golden Gate, Ill., 1909–10.
Little Wabash River at Carmi, Ill., 1909–10.
Skillet Fork at Wayne City, Ill., 1909–10.
Skillet Fork at Mill Shoals, Ill., 1909–10.

Cumberland River at Nashville, Tenn., 1901–1904.
Tennessee River—
- French Broad River at Rosman, N. C., 1907–1909.
- French Broad River at Horseshoe, N. C., 1904–1906.
- French Broad River at Asheville, N. C., 1895–1910.
- French Broad River at Newport, Tenn., 1900–1905; 1907.
- Tennessee River at Knoxville, Tenn., 1899–1910.
- Tennessee River at Chattanooga, Tenn., 1895–1910.
- Davidson River near Davidson River, N. C., 1904–1909.
- Little River at Calhoun, N. C., 1907–8.
- Mills River (North Fork) at Pinkbed, N. C., 1904–1909.
  - Mills River (South Fork) near Sitton, N. C., 1904–1909.
- Mud Creek at Naples, N. C., 1907.
- Swannanoa River at Swannanoa, N. C., 1907–1909.
- Swannanoa River at Biltmore, N. C., 1905.
- Ivy River at Democrat, N. C., 1907.
- Pigeon River at Canton, N. C., 1907–1909.
- Pigeon River at Newport, Tenn., 1900–1909.
- Nolichucky River at Chucky Valley, Tenn., 1900–1901.
- Nolichucky River at Greeneville, Tenn., 1903–1908.
  - North Toe River at Spruce Pine, N. C., 1907–8.
- Holston River (South Fork) near Chilhowie, Va., 1907–1909.
- Holston River (South Fork) at Bluff City, Tenn., 1900–1910.
- Holston River near Rogersville, Tenn., 1904–1909.
  - Holston River (Middle Fork) at Chilhowie, Va., 1907–1910.
  - Watauga River at Butler, Tenn., 1900–1901.
  - Watauga River near Elizabethton, Tenn., 1903–1908.
    - Elk Creek at Lineback, Tenn., 1900–1901.
    - Roane Creek at Butler, Tenn., 1900–1901.
    - Doe River at Elizabethton, Tenn., 1907–8.
  - Holston River (North Fork) at Daltville, Va., 1907–8.
- Little Tennessee River at Franklin, N. C., 1907–1910.
- Little Tennessee River at Judson, N. C., 1896–1910.
- Little Tennessee River at McGhee, Tenn., 1905–1910.
  - Cullasagee River at Cullasagee, N. C., 1907–1909.
  - Nantahala River near Nantahala, N. C., 1907–1909.
  - Tuckasegee River near East Laport, N. C., 1907–1909.
  - Tuckasegee River at Bryson, N. C., 1896–1910.
    - Scotts Creek near Dillsboro, N. C., 1907–8.
    - Oconalufty River near Cherokee, N. C., 1907–8.
    - Cheoah River at Millsaps, N. C., 1907–8.
  - Clinch River at Clinchport, Va., 1907–1909.
  - Hiwassee River near Hayesville, N. C., 1907–1909.
  - Hiwassee River at Murphy, N. C., 1896–1910.
  - Hiwassee River at Reliance, Tenn., 1900–1910.
  - Hiwassee River at Charlestown, Tenn., 1899–1901; 1903.
    - Tusquitee Creek near Hayesville, N. C., 1907–1909.
    - Valley River at Tomotla, N. C., 1904–1909.
    - Nottely River at Ranger, N. C., 1901–1905.
    - Toccoa River near Dial, Ga., 1907–8.
    - Toccoa River at Blueridge, Ga., 1899–1903.
    - Ocoee River at McCays (Copper Hill), Tenn., 1903–1910.
  - Elk Creek near Elkmont, Ala., 1904–1908.
  - Duck River at Columbia, Tenn., 1904–1908.

ALLEGHENY RIVER BASIN.

GENERAL FEATURES.

Allegheny River drains the western slopes of the Allegheny Mountains in Pennsylvania and New York.

The river rises in the central part of Potter County, in northern Pennsylvania, flows in a general northwesterly direction into New York to about the central part of Cattaraugus County, where it turns and flows southwestward back into Pennsylvania; at Franklin, in Venango County, it turns and flows southeastward to the mouth of Mahoning Creek, in Armstrong County, where it again bends to the southwest, and at Pittsburgh joins the Monongahela to form the Ohio. The river is about 290 miles long (map measurement) and its drainage area, which is nearly 50 per cent greater than that of the Monongahela, comprises about 11,100 square miles.

The important tributaries, beginning at the source and following down the right bank, are Oswayo, Olean, Conewango, Brokenstraw, Oil, and French creeks; on the left bank are Potato, Tunugwant, and Tionesta creeks, Clarion River, Red Bank, Mahoning, and Crooked creeks, and Kiskiminitas River.

The elevation of the sources of the river is about 2,500 feet above sea level; at Olean, N. Y., the elevation is 1,420 feet; at Franklin, Pa., the elevation is 960 feet; at Pittsburgh the elevation is 692 feet.

The basin is somewhat regular in shape, being about 2½ times as long as it is wide. Its northwestern boundary is at one point about 8 miles from Lake Erie, lying within about 40 miles of Buffalo. Below Franklin, Pa., the river flows near the western boundary of its basin. The surrounding country is made up of high hills or mountains separated by deep valleys, but west of the main river the country is less mountainous though the surface is still rolling and hilly.

The bed of the stream is composed chiefly of gravel ranging in size from small pebbles to cobblestones. The banks are made up of sand, gravel, or clay. The area is underlain by shales, and except in stream valleys the soil has little depth.

This basin is exceptionally rich in natural resources, coal, oil, gas, limestone, glass sand, and building stones occurring in abundance.

This basin was at one time covered with timber, the principal varieties being pine and hemlock. At present, however, only light forests and brush are found at the headwaters of the tributaries, the pine and hemlock having been cut off some time ago.

The mean annual rainfall in this region is about 40 inches and the winters are severe. Snowfall is heavy in the upper part of the basin and lasts for long periods, and ice forms to a thickness of about 2 feet. The heavy ice during the spring floods is very destructive. Jams frequently occur which cause considerable damage from backwater.

The basin affords good opportunities for storage reservoirs. Careful surveys would undoubtedly show a number of excellent sites for reservoirs of large capacity.

Allegheny River is subject to very severe floods, which cause heavy losses to manufacturing and other interests along the river.

The river is navigable for part of the year for small steamers to Franklin, 123 miles above the mouth.

The fall of the main river and tributaries is comparatively large and if the stream were in a district where fuels were more expensive, it would undoubtedly be much used for power. When the price of coal advances so that water power can compete with steam, the water power on this stream will be more extensively developed.

The Cuba Reservoir, which feeds the Erie Canal through Genesee River, lies on the divide between the Allegheny and Genesee drainage basins. Part of the overflow from this reservoir passes into the Allegheny and the rest into the Genesee.

ALLEGHENY RIVER AT RED HOUSE, N. Y.

This station, which is located at the Red House highway bridge, near the stations of the Erie and Pennsylvania railroads, about 5 miles below Salamanca, N. Y., and nearly 13 miles above the point where the river leaves New York State, was established September 4, 1903, to obtain general statistical data regarding the flow of the Allegheny, and is maintained in cooperation with the New York State engineer's department.

At Olean, N. Y., the wasteway from the Cuba Reservoir enters the river through Olean Creek. This reservoir is located on the divide between Oil Creek, tributary to Allegheny River and Genesee River. The storage is commonly turned into Genesee River through the abandoned summit level of Genesee Valley Canal, but may be diverted into Oil Creek through the guard lock at the head of the canal. There are no lakes and no artificial storage tributary to the stream above the gaging station. Conewango Creek, the outlet of Chautauqua Lake, enters the Allegheny in the State of Pennsylvania.

The datum of the chain gage attached to the highway bridge has remained the same during the maintenance of the station. Conditions for obtaining the accurate discharge are good, and an excellent rating curve has been developed. Moderate ice conditions usually prevail during the winter months.

Information in regard to this station is contained in the reports of the New York State engineer and surveyor.

Discharge measurements of Allegheny River at Red House, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 24[a]	W. G. Hoyt	255	173	3.04	326
Aug. 25	C. C. Covert	344	1,050	3.30	604

[a] Measurement July 24 made by wading below bridge.

Daily gage height, in feet, of Allegheny River at Red House, N. Y., for 1910.

[W. E. Coe, observer.[a]]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.0	.....	10.5	5.0	7.0	4.5	3.0	3.0	3.02	3.1	4.35	5.0
2	.....	.....	13.6	5.0	7.0	4.5	3.0	3.0	3.12	3.1	4.4	4.9
3	.....	.....	11.4	5.0	7.5	4.5	3.0	2.8	3.2	3.1	4.5	4.85
4	.....	.....	11.0	4.8	8.0	4.5	3.0	2.75	3.35	3.02	4.6	4.6
5	.....	5.0	10.9	4.5	8.0	4.5	3.0	2.7	3.8	2.98	4.55	4.55
6	.....	.....	10.3	4.5	7.0	4.5	3.0	2.7	5.5	3.27	4.45	4.4
7	.....	.....	10.5	4.5	7.0	4.5	3.0	2.7	5.62	3.88	4.25	4.2
8	4.0	.....	9.5	4.5	7.0	4.5	3.0	2.7	4.8	3.8	4.0	4.1
9	.....	.....	9.1	4.2	7.0	4.5	3.0	2.7	4.4	3.61	3.9	4.0
10	.....	.....	9.0	4.0	6.5	4.0	3.0	3.0	4.12	3.4	4.4	4.0
11	.....	.....	9.0	4.0	6.5	4.0	3.5	3.1	3.8	3.28	5.7	3.95
12	.....	4.5	8.8	4.0	6.0	4.0	3.5	3.1	3.6	3.2	5.5	3.95
13	.....	.....	8.0	4.1	6.0	4.0	3.5	3.0	3.52	3.05	4.6	3.9
14	.....	.....	7.4	4.1	6.0	4.0	4.0	3.0	3.4	3.0	4.9	3.9
15	4.0	.....	6.0	3.8	5.5	4.0	4.0	2.9	3.32	3.0	4.9	3.9
16	.....	.....	5.6	3.6	5.5	3.5	4.0	2.9	3.18	3.0	4.8	3.95
17	.....	.....	5.5	3.6	5.0	3.5	4.0	2.9	3.15	3.0	4.75	3.95
18	.....	.....	5.5	3.8	4.0	3.5	3.5	2.9	3.1	3.0	4.6	3.95
19	.....	4.5	5.4	3.8	4.0	4.0	3.5	3.0	3.1	3.05	4.65	3.95
20	.....	.....	6.0	5.0	4.0	4.0	3.5	3.0	3.05	3.0	4.5	3.95
21	.....	.....	6.6	6.2	4.0	4.0	3.5	3.0	3.0	3.02	4.45	3.95
22	5.0	.....	7.0	6.4	4.0	3.5	3.5	2.9	3.0	2.92	4.4	3.95
23	.....	.....	7.0	6.6	4.0	3.5	3.5	3.0	2.9	3.1	4.7	3.95
24	.....	.....	7.1	7.4	4.5	3.5	3.05	3.2	3.01	3.25	5.35	3.95
25	.....	.....	7.1	8.0	4.5	3.5	3.05	3.3	3.32	3.4	5.5	3.95
26	.....	5.0	7.3	9.2	4.0	3.0	3.0	3.2	3.4	3.6	5.65	4.0
27	.....	8.1	7.3	9.0	4.0	3.0	3.0	3.2	3.5	3.8	5.6	4.2
28	.....	9.1	7.2	8.5	4.0	3.0	3.0	3.2	3.4	4.1	5.8	4.4
29	4.5	.....	7.2	8.2	4.0	3.0	3.05	3.2	3.3	4.35	5.5	4.55
30	.....	.....	7.0	8.6	4.0	3.0	3.05	3.15	3.25	4.35	5.3	6.5
31	.....	.....	6.5	.....	4.5	.....	3.05	3.0	.....	4.25	.....	7.3

[a] Observer Jan. 1 to Aug. 24, inclusive, found to be unreliable; records for this period are questionable. Present observer, Mr. W. E. Coe, is considered reliable.

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 to Feb. 27 and about Dec. 12 to 26.

Daily discharge, in second-feet, of Allegheny River at Red House, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	23,600	3,130	8,740	2,200	320	320	337	405	1,970	3,130
2	.....	.....	41,000	3,130	8,740	2,200	320	320	424	405	2,040	2,920
3	.....	.....	28,400	3,130	10,400	2,200	320	190	500	405	2,200	2,820
4	.....	.....	26,200	2,720	12,300	2,200	320	168	655	337	2,360	2,360
5	.....	.....	25,600	2,200	12,300	2,200	320	145	1,200	306	2,280	2,280
6	.....	.....	22,600	2,200	8,740	2,200	320	145	4,320	570	2,120	2,040
7	.....	.....	23,600	2,200	8,740	2,200	320	145	4,620	1,310	1,820	1,750
8	.....	.....	18,800	2,200	8,740	2,200	320	145	2,720	1,200	1,470	1,610
9	.....	.....	17,000	1,750	8,740	2,200	320	145	2,040	958	1,340	1,470
10	.....	.....	16,500	1,470	7,150	1,470	320	320	1,640	710	2,040	1,470
11	.....	.....	16,500	1,470	7,150	1,470	825	405	1,200	580	4,830	1,400
12	.....	.....	15,700	1,470	5,660	1,470	825	405	945	500	4,320	1,200
13	.....	.....	12,300	1,610	5,660	1,470	825	320	849	362	2,360	1,000
14	.....	.....	10,100	1,610	5,660	1,470	1,470	320	710	320	2,920	800
15	.....	.....	5,660	1,200	4,320	1,470	1,470	250	622	320	2,920	700
16	.....	.....	4,570	945	4,320	825	1,470	250	481	320	2,720	600
17	.....	.....	4,320	945	3,130	825	1,470	250	452	320	2,630	500
18	.....	.....	4,320	1,200	1,470	825	825	250	405	320	2,360	400
19	.....	.....	4,060	1,200	1,470	1,470	825	320	405	362	2,450	400
20	.....	.....	5,660	3,130	1,470	1,470	825	320	362	320	2,200	400
21	.....	.....	7,460	6,240	1,470	1,470	825	320	320	337	2,120	400
22	.....	.....	8,740	6,840	1,470	825	825	250	320	264	2,040	500
23	.....	.....	8,740	7,460	1,470	825	825	320	250	405	2,540	500
24	.....	.....	9,070	10,100	2,200	825	362	500	328	550	3,940	600
25	.....	.....	9,070	12,300	2,200	825	362	600	622	710	4,320	600
26	.....	.....	9,740	17,400	1,470	320	320	500	710	945	4,700	1,000
27	.....	10,800	9,740	16,500	1,470	320	320	500	825	1,200	4,570	1,750
28	.....	17,000	9,400	14,400	1,470	320	320	500	710	1,610	5,100	2,040
29	.....	.....	9,400	13,100	1,470	320	362	500	600	1,970	4,320	2,280
30	.....	.....	8,740	14,800	1,470	320	362	452	550	1,970	3,820	7,150
31	.....	.....	7,150	.....	2,200	.....	362	320	.....	1,820	.....	9,740

NOTE.—Daily discharge determined by means of a discharge rating curve that is well defined. Discharge Dec. 12 to 26 estimated by means of climatologic records, the discharge at Kittanning and in adjacent drainage areas. Discharge Feb. 27 estimated. Determinations for Dec. 12 to 26, published in the report of the New York State engineer and surveyor, have been revised.

Monthly discharge of Allegheny River at Red House, N. Y., for 1910.

[Drainage area, 1,640 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	2,500	1.52	1.75	D.
February	17,000	.....	2,200	1.34	1.40	D.
March	41,000	4,060	13,700	8.35	9.63	A.
April	17,400	945	5,270	3.21	3.58	A.
May	12,300	1,470	4,940	3.01	3.47	A.
June	2,200	320	1,350	.823	.92	A.
July	1,470	320	622	.379	.44	A.
August	600	145	319	.195	.22	B.
September	4,620	250	1,000	.610	.68	A.
October	1,970	264	713	.435	.50	A.
November	5,100	1,340	2,890	1.76	1.96	B.
December	9,740	400	1,800	1.10	1.27	C.
The year	41,000	145	3,120	1.90	25.82	

NOTE.—Discharge Jan. 1 to Feb. 26 estimated by means of climatologic records, the discharge at Kittanning, and in adjacent drainage areas. Mean discharge Feb. 1 to 26 estimated 1,300 second-feet. Determinations for January, February, and December, published in the report of the New York State engineer and surveyor, have been revised.

ALLEGHENY RIVER AT KITTANNING, PA.

This station, which is located at the Market Street Bridge in the city of Kittanning, Pa., was established by the United States Geological Survey August 18, 1904, to obtain general comparative and statistical data regarding the flow of Allegheny River for the study of flood prevention at Pittsburgh and on Ohio River and for the determination of the regimen of flow for power and navigation projects and for the prevention of pollution. The station is now maintained by the Water Supply Commission of Pennsylvania, who have furnished the records of gage height for 1910.

No important tributaries enter the Allegheny in the immediate vicinity of Kittanning. Crooked River enters from the east 4 miles below, and Kiskiminitas River enters from the east over 12 miles below the station.

The datum of the chain gage attached to the bridge has remained constant since the installation of the station.

The flow is obstructed by ice during short periods each winter. Conditions of flow are practically constant and an excellent low and medium stage rating curve has been developed. At high stages numerous measurements have been made. There is, however, a marked difference between the discharge at a given high gage height for rising and for falling stage, due to increase and decrease of slope. The difference at times amounts to as much as 15 per cent, and as the variation differs for each flood it is difficult to determine accurately the daily discharge at high stages.

Two discharge measurements were made at this station during 1910. The gage chain was found to be 0.10 foot too long, and was adjusted to its proper length on March 3, 1910. The last previous inspection of this station was made September 25, 1908.

Discharge measurements of Allegheny River at Kittanning, Pa., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 3	K. C. Grant	870	17,900	20.80	138,000
Mar. 5	F. W. Scheidenhelm	858	16,400	19.08	118,000

Daily gage height, in feet, of Allegheny River at Kittanning, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.55	6.78	19.95	6.83	8.26	4.96	2.36	1.83	1.68	2.95	5.48	8.30
2	4.48	6.12	20.72	6.42	8.12	5.04	2.32	1.85	2.04	2.62	6.22	7.60
3	5.46	6.24	20.74	6.23	8.12	5.36	2.29	1.86	2.86	2.68	6.74	7.03
4	5.65	6.18	20.35	6.01	8.10	5.68	2.25	1.80	4.78	3.02	6.82	6.52
5	6.00	6.12	19.86	5.81	8.04	6.02	2.21	1.72	4.68	3.50	6.75	6.20
6	6.80	6.12	20.45	6.00	7.92	5.98	2.16	1.62	3.51	3.50	5.62	6.10
7	6.76	6.02	20.75	6.23	7.81	5.92	2.24	1.60	3.12	3.52	6.21	5.60
8	6.63	5.81	17.92	5.88	7.76	5.62	2.20	1.60	3.10	3.71	6.82	5.25
9	6.58	6.14	16.42	5.21	7.34	5.21	2.18	1.60	3.22	3.80	6.90	5.00
10	6.55	6.22	13.76	4.42	7.18	5.15	2.17	1.60	3.35	3.85	7.00	4.80
11	6.24	6.18	12.22	4.40	6.09	5.02	2.10	1.65	3.46	3.79	7.12	4.20
12	5.95	6.05	10.90	4.36	5.48	4.82	2.20	1.74	3.58	3.54	8.40	4.40
13	6.00	5.86	10.00	4.30	5.16	4.68	2.22	1.85	3.31	3.26	8.80	4.72
14	5.45	5.52	10.00	4.25	4.83	4.51	2.10	2.00	3.04	3.02	8.22	4.66
15	5.51	5.50	9.04	4.16	4.60	4.22	2.24	1.91	2.77	2.72	7.87	4.60
16	5.75	5.32	8.51	4.08	4.48	4.10	2.51	1.85	2.38	2.20	7.45	4.00
17	6.05	5.51	8.00	4.25	4.39	3.96	2.88	1.75	2.22	2.41	6.82	3.65
18	10.80	5.62	7.82	4.20	4.42	3.91	2.92	1.71	2.19	2.48	6.40	3.40
19	14.32	5.80	7.88	5.12	4.48	3.74	2.86	1.65	2.08	2.44	6.20	3.86
20	13.06	6.10	8.12	5.40	4.50	3.62	2.64	1.64	1.98	2.50	5.98	4.55
21	13.02	6.32	8.88	6.32	4.58	3.44	2.48	1.59	1.91	2.56	6.00	4.80
22	13.42	6.46	11.11	7.32	5.12	3.26	2.32	1.52	1.94	2.48	6.20	5.10
23	10.11	6.64	10.92	7.15	5.26	3.02	2.20	1.48	2.08	2.40	6.40	5.60
24	10.08	6.82	10.62	7.02	5.35	2.90	2.15	1.56	3.12	2.61	6.60	6.00
25	9.46	7.04	10.52	9.24	5.35	2.67	2.12	1.92	6.00	2.82	7.90	6.50
26	8.76	7.10	10.60	12.48	5.28	2.58	2.08	2.00	5.36	2.96	9.03	6.30
27	8.12	7.30	9.72	12.25	5.24	2.56	1.98	2.10	4.72	3.03	9.00	5.80
28	8.72	16.72	8.73	11.64	5.18	2.60	1.90	2.11	4.12	3.73	8.30	5.80
29	7.96	.....	8.15	9.96	5.12	2.51	1.85	1.93	3.70	4.02	7.85	6.00
30	7.51	.....	7.15	8.82	5.12	2.43	1.85	1.77	3.32	4.60	8.40	14.75
31	7.12	.....	7.21	.....	5.10	.....	1.81	1.73	.....	5.20	.....	13.60

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 to 17, Feb. 5 to 21, and Dec. 12 to 28.

Daily discharge, in second-feet, of Allegheny River at Kittanning, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	17,300	120,000	17,600	24,900	9,390	2,130	1,350	1,170	3,270	11,500	25,200
2	.....	14,300	129,000	15,600	24,200	9,700	2,060	1,380	1,640	2,600	14,700	21,400
3	.....	14,800	129,000	14,800	24,200	11,000	2,010	1,390	3,080	2,710	17,100	18,600
4	.....	14,500	124,000	13,800	24,100	12,300	1,950	1,310	8,720	3,430	17,500	16,100
5	.....	.....	119,000	12,900	23,800	13,800	1,890	1,210	8,360	4,640	17,200	14,600
6	.....	.....	126,000	13,700	23,100	13,600	1,810	1,100	4,670	4,640	12,100	14,200
7	.....	.....	129,000	14,800	22,500	13,400	1,930	1,080	3,670	4,700	14,700	12,000
8	.....	.....	97,800	13,200	22,300	12,100	1,870	1,080	3,620	5,240	17,500	10,500
9	.....	.....	83,100	10,400	20,100	10,400	1,840	1,080	3,910	5,500	17,900	9,540
10	.....	.....	60,200	7,470	19,300	10,100	1,820	1,080	4,240	5,650	18,400	8,800
11	.....	.....	48,700	7,400	14,100	9,620	1,720	1,140	4,530	5,470	19,000	6,740
12	.....	.....	40,100	7,270	11,500	8,870	1,870	1,240	4,860	4,750	25,700	.....
13	.....	.....	34,700	7,060	10,200	8,360	1,900	1,380	4,140	4,010	27,900	.....
14	.....	.....	34,700	6,900	8,910	7,770	1,720	1,580	3,480	3,430	24,700	.....
15	.....	.....	29,300	6,610	8,080	6,800	1,930	1,450	2,890	2,790	22,800	.....
16	.....	.....	26,300	6,350	7,670	6,420	2,400	1,380	2,170	1,870	20,700	.....
17	.....	.....	23,500	6,900	7,370	5,980	3,120	1,250	1,900	2,220	17,500	.....
18	39,500	.....	22,600	6,740	7,470	5,830	3,200	1,200	1,860	2,340	15,500	.....
19	64,700	.....	22,900	10,000	7,670	5,330	3,080	1,140	1,690	2,270	14,600	.....
20	54,700	.....	24,200	11,100	7,740	4,980	2,640	1,120	1,550	2,380	13,600	.....
21	54,400	.....	28,400	15,200	8,020	4,480	2,340	1,070	1,450	2,490	13,700	.....
22	57,500	15,800	41,400	20,000	10,000	4,010	2,060	1,000	1,500	2,340	14,600	.....
23	35,400	16,700	40,200	19,100	10,600	3,410	1,870	960	1,690	2,200	15,500	.....
24	35,200	17,500	38,400	18,500	10,900	3,160	1,800	1,040	3,670	2,580	16,500	.....
25	31,600	18,600	37,800	30,400	10,900	2,690	1,750	1,470	13,700	2,990	23,000	.....

Daily discharge, in second-feet, of Allegheny River at Kittanning, Pa., for 1910—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	27,700	18,900	38,300	50,500	10,600	2,520	1,690	1,580	11,000	3,300	29,200	.....
27	24,200	19,900	33,100	48,900	10,500	2,490	1,550	1,720	8,510	3,460	29,000	.....
28	27,500	85,900	27,500	44,800	10,200	2,560	1,440	1,740	6,480	5,300	25,200	.....
29	23,300	.....	24,400	34,500	10,000	2,400	1,380	1,480	5,210	6,170	22,700	13,700
30	21,000	.....	19,100	28,000	10,000	2,250	1,380	1,270	4,160	8,080	25,700	68,300
31	19,000	.....	19,400	.....	9,930	.....	1,320	1,230	.....	10,300	.....	58,900

NOTE.—Daily discharge determined from a discharge rating curve fairly well defined up to discharge 1,870 second-feet (gage height 2.2 feet); well defined between discharges 2,030 and 20,400 second-feet (gage heights 2.3 and 7.4 feet); and poorly defined above discharge 20,900 second-feet (gage height 7.5 feet); as noted in description of station. Discharge January 1 to 17, February 5 to 21, and December 12 to 28, estimated because of ice, from climatologic records and discharge of adjacent drainage areas. Mean discharge January 1 to 17, estimated at 4,500 second-feet. Mean discharge February 5 to 21, estimated at 8,350 second-feet, varying from about 3,000 to 14,000 second-feet. Mean discharge December 12 to 28, estimated at 5,000 second-feet, varying from about 3,000 to 10,000 second-feet.

Monthly discharge of Allegheny River at Kittanning, Pa., for 1910.

[Drainage area, 8,690 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January[a]	64,700	.....	19,100	2.20	2.54	C.
February[a]	85,900	.....	14,100	1.62	1.69	C.
March	129,000	19,100	57,200	6.58	7.59	A.
April	50,500	6,350	17,400	2.00	2.23	A.
May	24,900	7,470	13,900	1.60	1.84	A.
June	13,800	2,250	7,190	.827	.92	A.
July	3,200	1,320	1,980	.228	.26	A.
August	1,740	960	1,270	.146	.17	B.
September	13,700	1,170	4,320	.497	.55	A.
October	10,300	1,870	3,970	.457	.53	A.
November	29,200	11,500	19,200	2.21	2.47	A.
December[a]	68,300	.....	12,400	1.43	1.65	C.
The year	129,000	.....	14,400	1.66	22.44	

[a] See footnotes under table of daily discharge for periods of estimated discharge.

KISKIMINITAS RIVER AT AVONMORE, PA.

Kiskiminitas River is formed at Saltsburg, Pa., by the union of Conemaugh River with Loyalhanna Creek.

The gaging station, which is about 5 miles below the junction, was established June 11, 1907, at the highway bridge near Avonmore station on the Pennsylvania Railroad. It is maintained by the Water Supply Commission of Pennsylvania, which has furnished the records of gage height for 1910.

This river is subject to sudden violent floods similar to those which occur in Youghiogheny and Monongahela rivers and which, when combined, have such disastrous effects at Pittsburgh and other cities on Ohio River. In the flood of March 19, 1908, the Kiskiminitas rose to a crest height of 30.8 feet, and its discharge was estimated at 80,500 second-feet, or 46 second-feet per square mile from a drainage area of 1,750 square miles.

Blacklegs Creek enters from the right about 4 miles above the station, and Long Run enters from the right about 1 mile below the station.

The discharge is affected by ice for short periods during the winter months. The datum of the chain gage attached to the bridge has remained unchanged since the establishment of the station. The gage chain was found to be 0.05 foot too long and was adjusted to its proper length on March 2, 1910. The last previous inspection of this station was made September 25, 1908.

The following discharge measurement was made by K. C. Grant, an engineer of the Water Supply Commission of Pennsylvania:

March 2, 1910: Width, 444 feet; area, 6,430 square feet; gage height, 16.70 feet discharge, 27,200 second-feet.

Daily gage height, in feet, of Kiskiminitas River at Avonmore, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.05	5.35	18.25	3.57	5.73	4.45	3.37	1.96	1.80	2.39	2.12	4.13
2	5.25	4.85	16.38	3.44	5.06	4.79	3.19	1.96	1.83	2.25	2.09	3.15
3	8.35	5.05	15.10	3.37	4.70	4.99	3.07	1.91	1.95	2.13	2.09	3.13
4	11.45	5.95	12.78	3.27	4.68	4.79	2.95	1.91	3.71	2.06	2.09	3.35
5	7.35	5.55	11.45	3.29	4.50	4.42	2.99	1.88	5.50	2.03	2.12	3.34
6	9.45	5.05	11.28	3.37	4.06	4.92	2.79	1.86	3.64	1.97	2.14	4.01
7	11.45	6.75	12.20	3.24	3.80	5.88	2.79	1.86	4.35	2.00	2.09	4.61
8	9.05	6.85	10.00	3.14	3.68	5.02	3.41	1.86	3.67	1.99	2.09	4.28
9	7.15	7.45	8.37	3.09	3.66	4.49	3.17	1.86	3.17	1.96	2.04	3.95
10	6.25	6.35	7.27	2.96	3.76	5.07	2.92	1.91	2.93	1.94	2.04	3.43
11	8.25	7.85	6.51	2.91	3.73	6.82	2.71	2.06	2.70	1.94	2.09	4.01
12	10.95	7.45	5.99	2.77	4.78	6.89	2.61	2.36	2.85	1.92	2.10	3.93
13	11.95	7.05	5.69	2.71	4.76	6.18	2.70	2.26	3.10	1.89	2.14	3.78
14	11.45	7.35	5.54	2.74	4.16	5.62	2.84	2.16	4.30	1.89	2.10	3.81
15	11.75	7.45	4.94	2.64	3.90	5.09	2.67	1.87	3.65	1.89	2.14	3.73
16	11.45	10.75	4.67	2.66	3.69	5.08	2.52	1.94	2.95	1.90	2.16	3.63
17	10.75	23.50	5.01	2.83	3.48	4.95	6.31	1.88	2.70	1.89	2.26	3.65
18	13.75	20.95	4.99	3.28	3.56	5.28	4.11	1.86	2.60	1.89	2.24	3.59
19	19.95	16.45	4.71	5.66	3.68	10.37	3.88	1.88	2.37	1.89	2.24	3.72
20	11.55	15.25	4.79	5.58	3.62	7.63	3.14	1.94	2.30	1.86	2.33	4.02
21	8.55	17.75	5.14	6.36	3.92	6.27	2.76	2.56	2.23	1.86	2.24	4.48
22	17.15	18.95	5.34	6.56	5.06	5.12	2.54	2.18	2.17	1.95	2.18	4.41
23	10.65	11.05	5.04	6.06	4.63	4.62	2.40	2.02	2.13	2.29	2.23	4.31
24	8.75	8.35	4.87	5.66	4.46	4.17	2.36	1.97	2.21	2.68	2.33	5.75
25	7.45	7.25	4.71	9.93	4.88	3.81	2.24	1.90	2.50	2.34	2.33	6.93
26	6.35	6.65	4.54	11.38	5.99	3.57	2.18	1.95	2.43	2.20	2.53	5.63
27	8.05	7.95	4.24	8.86	5.29	3.37	2.11	1.90	2.39	2.19	2.69	4.26
28	8.15	17.50	4.04	7.58	4.72	3.33	2.10	1.85	2.30	2.19	2.75	4.98
29	7.05	.....	3.84	6.60	4.43	4.92	2.06	1.85	2.75	2.15	3.95	9.57
30	6.15	.....	3.77	6.16	4.09	4.11	2.04	1.80	2.65	2.14	4.25	13.83
31	5.85	.....	3.71	.....	4.02	.....	1.96	1.84	.....	2.09	.....	9.53

NOTE.—Gage heights Mar. 9 to Dec. 31 differ by 0.02 foot, or less, from those published by the Water Supply Commission of Pennsylvania, owing to differences in methods of interpretation of corrections to be applied for errors in gage. Relation of gage height to discharge probably affected by ice about Jan. 1, 2, 10, 11, 12, 13, Feb. 7 to 16, and Dec. 11 to 24.

Daily discharge, in second-feet, of Kiskiminitas River at Avonmore, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	200	2,880	33,300	1,100	3,340	1,870	949	185	128	367	248	1,570
2	1,800	2,300	27,200	998	2,530	2,230	824	185	138	304	236	798
3	7,060	2,520	23,300	949	2,130	2,450	746	167	182	253	236	784
4	13,300	3,620	16,800	879	2,110	2,230	670	167	1,210	224	236	935
5	5,500	3,120	13,300	893	1,920	1,840	694	156	3,060	212	248	928
6	9,000	2,520	12,900	949	1,500	2,370	574	149	1,150	189	257	1,460
7	13,300	.....	15,300	858	1,280	3,530	574	149	1,770	200	236	2,030
8	8,270	.....	10,000	791	1,180	2,480	977	149	1,180	196	236	1,700
9	5,210	.....	7,100	758	1,170	1,910	810	149	810	185	216	1,400
10	3,500	.....	5,380	676	1,250	2,540	652	167	658	178	216	991
11	3,000	.....	4,350	646	1,220	4,760	530	224	525	178	236	.....
12	2,500	.....	3,680	564	2,220	4,850	476	354	610	170	240	.....
13	7,000	.....	3,290	530	2,200	3,920	525	308	765	160	257	.....
14	13,300	.....	3,110	547	1,590	3,200	604	265	1,720	160	240	.....
15	14,100	.....	2,390	492	1,360	2,570	508	152	1,160	160	257	.....
16	13,300	.....	2,100	503	1,190	2,560	430	178	670	163	265	.....
17	11,600	51,900	2,470	598	1,030	2,400	4,090	156	525	160	308	.....
18	19,500	42,600	2,450	886	1,090	2,800	1,550	149	470	160	300	.....
19	39,100	27,400	2,140	3,250	1,180	10,800	1,340	156	358	160	300	.....
20	13,600	23,800	2,230	3,160	1,140	5,920	791	178	326	149	340	.....
21	7,400	31,700	2,630	4,160	1,380	4,040	558	450	295	149	300	.....
22	29,700	35,700	2,870	4,420	2,530	2,600	440	274	269	182	274	.....
23	11,400	12,400	2,510	3,770	2,050	2,040	372	208	253	322	295	.....
24	7,740	7,060	2,320	3,250	1,880	1,600	354	189	286	514	340	.....
25	5,640	5,350	2,140	9,910	2,330	1,290	300	163	420	344	340	4,900
26	4,140	4,540	1,960	13,200	3,680	1,100	274	182	386	282	435	3,220
27	6,580	6,420	1,670	7,930	2,810	949	244	163	367	278	520	1,680
28	6,740	30,800	1,490	5,840	2,150	921	240	146	326	278	552	2,440
29	5,070	.....	1,310	4,470	1,850	2,370	224	146	552	261	1,400	9,220
30	3,880	.....	1,260	3,900	1,530	1,550	216	128	498	257	1,680	19,700
31	3,500	.....	1,210	.....	1,470	.....	185	142	.....	236	.....	9,150

NOTE.—Daily discharge determined by means of a discharge rating curve well defined between discharges 65 and 23,000 second-feet (gage heights 1.6 and 15.0 feet). Daily discharge Jan. 1, 2, 10 to 13, Feb. 7 to 16, and Dec. 11 to 24, estimated, because of ice, from climatologic records and discharge of adjacent drainage areas. Mean discharge Feb. 7 to 16 estimated 1,760 second-feet, varying from about 900 to 5,000 second-feet. Mean discharge Dec. 11 to 24 estimated 665 second-feet, varying from about 400 to 2,000 second-feet.

Monthly discharge of Kiskiminitas River at Avonmore, Pa., for 1910.

[Drainage area, 1,750 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	39,100	200	9,630	5.50	6.34	C.
February	51,900	.....	11,200	6.40	6.66	C.
March	33,300	1,210	6,910	3.95	4.55	A.
April	13,200	492	2,700	1.54	1.72	A.
May	3,680	1,030	1,820	1.04	1.20	A.
June	10,800	921	2,860	1.63	1.82	A.
July	4,090	185	701	.401	.46	A.
August	450	128	191	.109	.13	A.
September	3,060	128	702	.401	.45	A.
October	514	149	227	.130	.15	A.
November	1,680	216	375	.214	.24	A.
December	19,700	.....	2,330	1.33	1.53	C.
The year	51,900	128	3,260	1.86	25.25	

NOTE.—See footnotes to table of daily discharge for notes relative to periods during which discharge was estimated.

BLACKLICK CREEK AT BLACKLICK, PA.

This station was established by the United States Geological Survey at the highway bridge about one-fourth mile from the railroad station August 16, 1904; was discontinued July 15, 1906; and was reestablished January 8, 1907, by the Water Supply Commission of Pennsylvania, by which the records of gage height in the following table are furnished.

The station is about 6 miles above the junction of Blacklick Creek with Conemaugh River and about 1 mile below the junction of Blacklick and Two Lick creeks.

The channel is obstructed by ice for short periods during the winter months. The datum of the gage has remained constant during the maintenance of the station.

Changes in rating curves necessitated by construction work on bridge to which gage is attached have been discussed in Water-Supply Paper 263.

The gage chain was found to be 0.03 foot too long and was adjusted to its proper length on March 1, 1910. The last previous inspection of this station was made September 24, 1908.

The following discharge measurement was made by K. C. Grant:

March 1, 1910: Width, 208 feet; area, 1,500 square feet; gage height, 7.94 feet; discharge, 7,180 second-feet.

Daily gage height, in feet, of Blacklick Creek at Blacklick, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.44	3.57	8.28	2.88	3.63	3.34	2.46	2.12	2.02	2.28	2.26	3.08
2	2.87	3.44	7.28	2.82	3.42	3.49	2.38	2.09	2.12	2.23	2.32	2.98
3	4.69	3.63	7.06	2.77	3.34	3.38	2.38	2.06	2.43	2.21	2.30	2.98
4	4.65	3.67	6.19	2.74	3.40	3.22	2.33	2.05	5.19	2.20	2.32	2.94
5	4.05	3.56	5.95	2.76	3.24	3.14	2.30	2.04	4.16	2.20	2.31	2.86
6	5.47	3.33	5.84	2.74	3.10	3.79	2.28	2.04	3.74	2.18	2.28	2.78
7	5.15	3.23	6.24	2.72	3.02	3.56	2.35	2.04	3.80	2.22	2.26	2.87
8	5.27	3.32	5.10	2.68	2.98	3.38	2.40	2.06	3.21	2.18	2.26	2.82
9	7.63	3.37	4.53	2.66	2.99	3.22	2.34	2.03	3.08	2.20	2.24	2.78
10	7.19	3.59	4.16	2.62	3.00	3.72	2.32	2.14	2.96	2.18	2.26	2.81
11	6.51	3.55	3.95	2.56	3.01	3.84	2.28	2.30	2.84	2.18	2.30	2.88
12	6.33	3.45	3.82	2.53	3.32	3.72	2.24	2.38	2.74	2.19	2.30	2.94
13	6.43	3.53	3.70	2.50	3.05	3.52	2.35	2.26	3.25	2.16	2.30	2.94
14	6.34	3.49	3.83	2.50	2.92	3.37	2.40	2.19	3.14	2.13	2.28	3.10
15	5.52	3.37	3.66	2.48	2.84	3.25	2.33	2.12	2.86	2.12	2.44	3.08
16	4.51	5.37	3.40	2.59	2.80	3.58	4.56	2.19	2.66	2.12	2.38	3.03
17	3.81	5.88	3.44	2.68	2.74	3.38	4.10	2.18	2.54	2.12	2.38	3.01
18	10.15	5.01	3.34	3.41	2.92	3.23	3.22	2.20	2.46	2.10	2.40	3.00
19	8.35	4.31	3.32	3.79	3.02	3.18	2.78	2.28	2.42	2.10	2.30	3.16
20	5.76	4.05	3.45	3.79	2.87	3.04	2.61	2.21	2.38	2.10	2.34	3.56
21	7.11	4.69	3.66	4.54	3.56	2.91	2.47	2.18	2.35	2.10	2.32	3.66
22	7.16	5.96	3.54	4.24	3.86	2.76	2.38	2.15	2.31	2.79	2.40	3.62
23	5.39	5.35	3.44	3.88	3.56	2.72	2.34	2.10	2.29	2.77	2.41	3.54
24	4.81	4.61	3.39	3.78	3.39	2.60	2.30	2.06	2.35	2.68	2.48	4.60
25	4.37	4.35	3.34	6.03	4.05	2.52	2.27	2.06	2.35	2.46	2.56	4.25
26	3.97	4.07	3.25	5.52	3.86	2.46	2.24	2.11	2.40	2.38	2.81	3.92
27	5.01	6.01	3.16	4.76	3.56	2.41	2.22	2.08	2.34	2.36	2.72	3.76
28	4.64	9.27	3.02	4.27	3.38	2.66	2.22	2.07	2.38	2.35	2.80	3.65
29	4.21	.....	2.96	4.00	3.22	2.79	2.18	2.05	2.48	2.32	3.57	6.00
30	3.86	.....	2.97	3.88	3.13	2.57	2.18	2.06	2.32	2.30	3.38	7.63
31	3.79	.....	2.92	.....	3.22	.....	2.15	2.03	.....	2.30	.....	5.98

NOTE.—Relation of gage height to discharge probably affected by ice from about Jan. 8 to 15, Feb. 8 to 16, and Dec. 7 to 28.

Daily discharge, in second-feet, of Blacklick Creek at Blacklick, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	122	639	7,910	272	681	492	128	42	24	78	73	356
2	268	551	5,740	248	538	583	105	36	42	66	88	312
3	1,610	681	5,280	230	492	514	105	31	119	61	83	312
4	1,570	709	3,650	219	525	426	91	30	2,180	59	88	296
5	1,010	632	3,250	226	437	385	83	28	1,100	59	86	264
6	2,540	486	3,070	219	365	798	78	28	760	55	78	233
7	2,130	432	3,740	212	329	632	96	28	805	64	73	.....
8	.....	.....	2,070	198	312	514	110	31	420	55	73	.....
9	.....	.....	1,450	192	316	426	94	26	356	59	69	.....
10	.....	.....	1,100	179	320	745	88	46	304	55	73	.....
11	.....	.....	925	159	324	837	78	83	256	55	83	.....
12	.....	.....	821	150	481	745	69	105	219	57	83	.....
13	.....	.....	730	140	342	604	96	73	442	51	83	.....
14	.....	.....	829	140	288	508	110	57	385	44	78	.....
15	.....	.....	702	134	256	442	91	42	264	42	122	.....
16	1,430	.....	525	169	240	646	1,480	57	192	42	105	.....
17	813	3,140	551	198	219	514	1,050	55	153	42	105	.....
18	12,300	1,960	492	532	288	432	426	59	128	38	110	.....
19	8,080	1,240	481	798	329	405	233	78	116	38	99	.....
20	2,950	1,010	558	798	268	338	175	61	105	38	94	.....
21	5,380	1,610	702	1,460	632	284	131	55	96	38	88	.....
22	5,490	3,270	618	1,180	853	226	105	48	86	236	110	.....
23	2,440	2,380	551	869	632	212	94	38	81	230	113	.....
24	1,740	1,530	520	790	520	172	83	31	96	198	134	.....
25	1,290	1,280	492	3,380	1,010	146	76	31	96	128	159	.....
26	941	1,020	442	2,610	853	128	69	40	110	105	244	.....
27	1,960	3,350	395	1,690	632	113	64	35	94	99	212	.....
28	1,560	10,200	329	1,200	514	192	64	33	105	96	240	.....
29	1,150	.....	304	965	426	236	55	30	134	88	639	3,330
30	853	.....	308	869	380	162	55	31	88	83	514	6,480
31	798	.....	288	.....	426	.....	48	26	.....	83	.....	3,300

NOTE.—Daily discharge determined by means of a discharge rating curve well defined between 7.5 and 1,320 second-feet (gage heights 1.9 and 4.4 feet), poorly defined between discharges 1,420 and 7,290 second-feet (gage heights 4.5 and 8.0 feet), and an extension above discharge 7,510 second-feet (gage height 8.1 feet). Daily discharge Jan. 8 to 15, Feb. 8 to 16, and Dec. 7 to 28 estimated, because of ice, from climatologic records and discharge of adjacent drainage areas. Mean discharge Jan. 8 to 15 estimated about 1,240 second-feet, varying from about 700 to 2,000 second-feet. Mean discharge Feb. 8 to 16 estimated 389 second-feet, varying from about 200 to 1,000 second-feet. Mean discharge Dec. 7 to 28 estimated about 275 second-feet, varying from about 120 to 1,000 second-feet.

Monthly discharge of Blacklick Creek at Blacklick, Pa., for 1910.

[Drainage area, 403 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January [a]	12,300	122	2,200	5.46	6.30	B.
February [a]	10,200	.....	1,420	3.52	3.66	B.
March	7,910	288	1,580	3.92	4.52	A.
April	3,380	134	681	1.69	1.89	A.
May	1,010	219	459	1.14	1.31	A.
June	837	113	429	1.06	1.18	A.
July	1,480	48	182	.452	.52	A.
August	105	26	45	.122	.14	A.
September	2,180	24	312	.774	.86	A.
October	236	38	78.8	.196	.23	A.
November	639	69	140	.347	.39	A.
December [a]	6,480	.....	675	1.67	1.92	C.
The year	12,300	24	680	1.69	22.92	

[a] See footnotes to table of daily discharge for notes relative to periods during which discharge was estimated.

MONONGAHELA RIVER BASIN.

GENERAL FEATURES.

The drainage basin of Monongahela River lies in the States of Pennsylvania, Maryland, and West Virginia. The river is formed in the east-central part of Marion County, W. Va., by the union of Tygart and West Fork rivers—two streams whose headwaters drain the western slopes of the Allegheny Mountains. From this junction point it flows northeastward across the Pennsylvania State line to the mouth of Cheat River, thence northward, and unites with Allegheny River to form the Ohio at Pittsburgh, Pa. The river is 125 miles long and its drainage area comprises about 7,350 square miles. It is navigable through its entire length by means of locks and dams.

The Tygart, also called Tygart Valley River, drains the country to the southeast of the head of Monongahela River; the West Fork, the country to the southwest. Tygart River rises in the southern part of Randolph County, W. Va., and flows northerly; the West Fork rises in the western part of Upshur County, W. Va., flows northwestward into Lewis County and thence in a slight northeasterly direction to its junction with the Tygart at Fairmont, W. Va. The Tygart is about 100 miles long (map measurement) and its drainage area above its mouth is about 1,420 square miles; the West Fork is about 70 miles (map measurement) long and drains about 845 square miles.

The sources of the West Fork head at an altitude of 1,500 feet above sea level; those of the Tygart at 3,500 feet. At Fairmont the Monongahela has an elevation of 860 feet, and at the mouth of the river at Pittsburgh the elevation is 692 feet above sea level.

The headwater country is mountainous, the slopes of the valleys are steep, and in many places precipitous, and the fall of the streams is rapid; farther down the country becomes less mountainous, but remains very rolling. The steep slopes and rocky soil of the upper country cause the heavy rains to run off rapidly, producing sudden and intense floods and a low flow in dry periods.

The headwater regions are covered with fine growths of hardwood timber, which are being rapidly lumbered. Below Fairmont the slope of the main stream is but little more than 1 foot per mile.

The basin is exceptionally rich in natural resources, as it is underlain by very valuable and extensive coal beds and contains oil and gas in abundance.

The important tributaries of the Monongahela, beginning at the head of the river and following down the east bank, are Cheat and Youghiogheny rivers; on the west bank are Buffalo and Tenmile creeks, neither of which is of much importance.

The country drained by Cheat and Youghiogheny rivers resembles that drained by Tygart and West Fork rivers, being mountainous and

rough at the headwaters, losing the mountainous character as the rivers are descended, and continuing rolling and hilly to the junctions with the main stream.

This basin was at one time covered with forests, but the greater part of the timber has been cut off, and though some still remains at the headwaters, the area of timbered land is small when compared to the total area of the basin.

The mean annual rainfall on that portion of the basin in West Virginia is from 45 to 50 inches; on the portion in Pennsylvania it is 40 to 45 inches. The winters in the southern part of the basin are comparatively mild. The snowfall is light and does not last long, and ice does not form very thick. In the northern part of the basin ice forms about a foot in thickness during severe winters, but in ordinary winters it is not very thick and it causes little trouble in floods.

The tributaries of Monongahela River afford a number of reservoir sites, some of which would store an immense quantity of water.

Fuel is so cheap and abundant in the drainage basin that little water power has been developed, although the main stream and its tributaries afford good opportunities. At the dams on the main stream a fall of about 140 feet is available for use. The low flow during dry spells is unfavorable for water-power development.

TYGART RIVER AT BELINGTON, W. VA.

This station, which is located at the highway bridge at Belington, W. Va., was established June 5, 1907.

Mill Creek is tributary one-fourth mile below the gage.

In general the winters are mild. Ice may affect the relation of gage height to discharge for two or three weeks at a time during December, January, and February.

The records are reliable and accurate. The datum of the chain gage attached to the bridge has remained unchanged.

Discharge measurements of Tygart River at Belington, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 17	C. T. Bailey	213	1,560	9.08	5,360
20	do	200	813	5.46	1,420
20	do	200	757	5.15	1,100
Aug 22	do	180	212	2.44	75.5
Oct 10	do	178	194	2.29	32.4

Daily gage height, in feet, of Tygart River at Belington, W. Va., for 1910.

[S. A. Campbell, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.6	4.2	4.9	3.0	3.8	3.7	3.1	3.0	2.2	2.8	2.7	3.9
2	4.1	3.8	5.4	3.0	3.6	4.5	3.1	2.8	2.2	2.6	2.7	3.7
3	11.4	4.3	5.0	3.0	3.5	4.8	3.0	2.6	2.3	2.5	2.7	3.8
4	10.3	5.0	4.7	3.0	3.6	5.0	3.3	2.7	2.3	2.5	2.7	3.5
5	6.6	5.0	4.4	3.2	3.4	5.3	3.6	2.6	2.8	2.4	2.7	3.1
6	5.6	5.2	4.2	3.2	3.2	8.8	3.9	2.6	3.0	2.3	2.6	3.8
7	9.3	6.8	4.0	3.1	3.2	7.9	3.4	2.6	3.3	2.2	2.6	3.7
8	8.3	6.2	3.9	3.2	3.2	5.7	3.6	2.5	3.0	2.2	2.5	3.6
9	7.5	6.2	3.7	3.1	3.6	4.8	3.9	2.4	2.9	2.2	2.5	3.6
10	4.8	7.8	3.5	3.0	4.1	4.8	3.8	2.5	2.8	2.2	2.5	3.5
11	4.1	7.9	3.5	3.0	4.0	5.3	3.8	2.4	2.7	2.7	2.5	3.3
12	3.9	8.3	3.5	3.0	5.4	6.8	3.2	2.4	2.6	2.6	2.5	3.3
13	3.9	7.8	3.4	3.0	8.3	7.2	4.0	2.3	2.5	2.4	2.4	3.3
14	4.8	7.8	3.4	3.3	5.9	6.3	5.5	2.4	3.0	2.4	2.3	3.3
15	6.4	7.8	3.4	3.5	5.4	5.7	4.7	2.4	3.4	2.3	2.3	3.2
16	4.9	10.6	3.4	3.4	4.2	10.35	4.1	2.2	3.0	2.3	2.4	3.0
17	4.6	9.0	3.3	3.4	3.9	14.15	4.1	2.2	2.8	2.2	2.3	3.0
18	5.3	8.4	3.3	3.4	3.8	11.5	4.4	2.2	2.7	2.2	2.4	3.1
19	10.8	7.1	3.2	3.8	3.7	11.4	4.2	2.0	2.6	2.2	2.4	3.2
20	7.5	5.5	3.2	4.0	3.6	11.4	3.7	2.1	2.5	2.2	2.4	3.8
21	5.8	5.2	3.1	4.0	3.6	6.5	3.3	2.1	2.5	2.1	2.4	4.3
22	8.0	6.8	3.3	4.6	3.5	6.5	3.2	2.5	2.4	2.2	2.4	3.8
23	7.5	8.2	3.3	5.1	3.4	6.0	3.0	2.6	2.4	2.2	2.4	3.6
24	5.2	6.1	3.2	4.8	3.4	4.8	2.8	2.4	2.3	2.2	2.4	4.8
25	4.6	5.1	3.2	6.6	4.3	4.0	2.8	2.6	2.3	2.7	2.5	6.6
26	4.2	4.6	3.2	5.9	5.1	3.9	2.7	2.6	2.3	2.5	2.8	6.4
27	5.0	4.4	3.1	5.4	4.4	3.5	2.6	2.4	2.3	2.5	2.8	5.4
28	6.8	4.1	3.1	4.8	4.0	3.4	2.8	2.3	2.5	2.5	3.3	4.7
29	5.7	.....	3.1	4.4	3.8	4.0	2.9	2.2	3.0	2.6	5.4	4.6
30	5.4	.....	3.0	4.0	3.5	3.3	3.2	2.2	3.0	2.7	4.2	7.4
31	4.6	.....	3.0	.....	3.5	.....	3.0	2.2	.....	2.8	.....	7.8

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 and 2, Feb. 5 to 16, and Dec. 6 to 24. Observer reported ice gorged Feb. 10 to 16.

Daily discharge, in second-feet, of Tygart River at Belington, W. Va., for 1907–1910.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1907.								1907.							
1	.....	363	546	183	246	644	546	16	6,870	644	183	246	213	546	2,620
2	.....	546	321	213	213	595	452	17	1,310	2,620	246	321	213	498	1,920
3	.....	1,500	282	246	183	1,250	363	18	1,070	16,500	363	246	246	407	1,190
4	.....	1,190	213	363	213	2,000	321	19	595	1,920	282	1,070	213	363	959
5	850	644	282	904	1,500	1,700	407	20	546	1,500	246	644	183	321	850
6	1,500	363	321	644	1,020	1,310	452	21	498	1,130	183	452	156	246	694
7	1,130	452	246	363	694	3,620	407	22	363	644	132	321	156	282	546
8	1,020	644	246	213	1,070	2,620	363	23	321	850	213	213	132	321	644
9	6,410	959	156	183	1,630	2,000	321	24	282	797	5,500	363	132	1,850	4,730
10	2,300	4,620	363	132	1,250	2,230	1,250	25	797	904	4,010	498	132	3,230	2,620
11	1,370	1,700	595	213	745	2,790	4,310	26	644	904	1,070	246	110	1,920	1,780
12	1,130	3,050	452	595	595	1,850	2,000	27	452	850	644	183	156	1,310	959
13	4,730	3,520	321	644	407	1,310	1,370	28	363	644	498	156	363	904	745
14	5,610	3,320	246	407	321	797	1,780	29	321	1,190	363	183	2,150	745	694
15	7,470	1,190	213	282	282	694	4,730	30	246	1,020	282	213	1,920	546	959
								31	.....	904	246	.....	1,630	.....	1,190

Daily discharge, in second-feet, of Tygart River at Belington, W. Va., for 1907–1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.												
1	1,070	745	797	5,610	498	959	73	183	36	12	7	26
2	959	1,850	8,190	3,230	546	644	59	132	36	12	7	26
3	850	1,700	4,520	2,540	644	546	47	36	36	12	12	26
4	694	1,440	2,460	1,630	745	595	213	90	26	7	7	26
5	797	1,310	1,500	1,070	4,310	2,000	904	156	26	7	18	26
6	904	2,620	1,920	904	6,410	1,070	498	246	26	7	26	36
7	745	2,790	3,910	745	3,320	694	321	110	26	7	36	36
8	1,920	1,920	2,790	797	6,300	546	246	110	26	7	26	36
9	2,460	1,560	2,540	2,960	3,230	363	213	132	18	7	18	36
10	2,300	1,020	2,380	3,140	6,520	282	183	156	18	7	18	36
11	2,070	904	2,070	4,310	5,950	213	156	132	18	7	18	47
12	5,500	1,920	1,310	4,110	2,300	246	90	156	18	7	18	73
13	7,230	4,520	1,070	2,230	1,500	213	110	90	18	7	18	132
14	3,620	6,060	904	1,310	850	183	90	73	18	4	18	183
15	1,700	5,950	850	959	745	246	183	59	18	4	18	156
16	1,190	8,920	904	1,190	1,630	282	132	47	18	4	18	110
17	1,020	2,620	850	2,300	1,130	321	90	47	12	7	18	90
18	850	1,920	959	1,500	694	183	183	47	12	7	18	73
19	745	1,310	1,630	1,630	959	156	321	36	12	7	18	73
20	694	1,250	3,710	2,150	2,790	213	156	36	12	7	18	132
21	745	1,070	2,150	1,560	3,620	246	132	36	12	7	18	183
22	850	797	1,190	1,020	2,870	282	246	36	12	7	18	110
23	1,700	644	1,020	850	1,920	213	246	36	7	7	18	132
24	1,500	595	959	546	1,070	183	282	36	7	7	18	110
25	1,370	498	850	498	904	156	546	18	7	7	18	90
26	694	546	745	644	2,070	156	1,700	47	7	7	18	90
27	2,000	850	595	694	1,250	132	2,460	47	7	7	18	90
28	2,230	745	644	745	850	132	904	59	7	7	18	90
29	1,560	595	904	595	644	110	644	90	7	7	18	90
30	1,370	.....	2,150	546	3,710	90	407	73	12	12	26	90
31	850	.....	2,070	.....	1,920	.....	282	47	.....	7	.....	156
1909.												
1	183	180	1,130	1,020	1,560	132	407	2,070	90	90	246	282
2	452	160	959	850	1,440	213	246	644	73	73	213	246
3	407	140	797	1,190	1,190	282	156	452	59	73	246	246
4	183	250	1,850	1,560	1,310	183	156	282	73	59	213	213
5	156	300	1,440	1,850	1,190	183	110	213	73	59	156	213
6	156	546	1,190	2,000	959	1,130	73	156	90	47	156	183
7	452	644	1,630	1,440	850	694	73	183	90	47	156	213
8	321	904	3,230	1,070	595	1,020	73	132	73	47	132	213
9	282	595	2,300	745	546	2,540	73	90	73	47	132	213
10	246	1,630	2,000	595	452	1,370	73	90	90	47	2,960	183
11	183	2,870	1,780	546	694	1,630	59	73	694	36	2,230	183
12	156	1,440	1,130	452	850	1,310	47	73	498	282	1,250	183
13	183	959	850	407	644	1,070	47	59	183	595	797	183
14	282	1,070	904	2,960	546	745	47	47	110	321	644	850
15	2,070	1,250	1,070	5,390	452	595	73	47	90	213	407	1,310
16	2,540	1,310	850	1,920	363	694	110	452	850	321	363	850
17	2,070	1,850	745	1,130	321	694	90	904	1,700	246	321	595
18	1,630	1,440	595	850	246	2,960	73	644	407	321	282	452
19	694	1,070	452	595	183	1,560	59	363	321	595	246	.....
20	595	959	498	546	183	1,070	59	246	183	745	246	.....
21	595	1,130	498	1,850	213	452	59	321	132	850	213	.....
22	498	1,440	452	3,520	282	363	47	282	110	452	213	.....
23	407	1,370	452	3,620	282	246	73	246	90	407	246	.....
24	363	1,370	407	4,310	282	213	183	183	321	5,720	282	.....
25	363	2,300	452	2,540	246	183	183	132	110	2,070	595	.....
26	363	1,850	694	1,560	213	156	156	90	156	1,190	498	.....
27	321	1,560	1,250	1,560	213	110	110	73	183	644	407	.....
28	282	1,370	1,630	1,310	246	321	110	73	156	595	363	.....
29	246	.....	1,850	1,370	282	321	90	59	132	452	282	.....
30	220	.....	1,440	1,130	246	213	90	26	110	363	282	.....
31	200	.....	1,190	.....	183	.....	3,520	132	.....	321	.....	.....

Daily discharge, in second-feet, of Tygart River at Belington, W. Va., for 1907–1910—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	100	694	1,070	183	498	452	213	183	36	132	110	546
2	400	498	1,370	183	407	850	213	132	36	90	110	452
3	7,110	745	1,130	183	363	1,020	183	90	47	73	110	498
4	5,840	1,130	959	183	407	1,130	282	110	47	73	110	363
5	2,230	.....	797	246	321	1,310	407	90	132	59	110	213
6	1,500	.....	694	246	246	4,210	546	90	183	47	90	.....
7	4,730	.....	595	213	246	3,320	321	90	282	36	90	.....
8	3,710	.....	546	246	246	1,560	407	73	183	36	73	.....
9	2,960	.....	452	213	407	1,020	546	59	156	36	73	.....
10	1,020	.....	363	183	644	1,020	498	73	132	36	73	.....
11	644	.....	363	183	595	1,310	498	59	110	110	73	.....
12	546	.....	363	183	1,370	2,380	246	59	90	90	73	.....
13	546	.....	321	183	3,710	2,700	595	47	73	59	59	.....
14	1,020	.....	321	282	1,700	2,000	1,440	59	183	59	47	.....
15	2,070	.....	321	363	1,370	1,560	959	59	321	47	47	.....
16	1,070	.....	321	321	694	5,890	644	36	183	47	59	.....
17	904	4,410	282	321	546	10,500	644	36	132	36	47	.....
18	1,310	3,810	282	321	498	7,230	797	36	110	36	59	.....
19	6,410	2,620	246	498	452	7,110	694	18	90	36	59	.....
20	2,960	1,440	246	595	407	7,110	452	26	73	36	59	.....
21	1,630	1,250	213	595	407	2,150	282	26	73	26	59	.....
22	3,420	2,380	282	904	363	2,150	246	73	59	36	59	.....
23	2,960	3,620	282	1,190	321	1,780	183	90	59	36	59	.....
24	1,250	1,850	246	1,020	321	1,020	132	59	47	36	59	.....
25	904	1,190	246	2,230	745	595	132	90	47	110	73	2,230
26	694	904	246	1,700	1,190	546	110	90	47	73	132	2,070
27	1,130	797	213	1,370	797	363	90	59	47	73	132	1,370
28	2,380	644	213	1,020	595	321	132	47	73	73	282	959
29	1,560	.....	213	797	498	595	156	36	183	90	1,370	904
30	1,370	.....	183	595	363	282	246	36	183	110	694	2,870
31	904	.....	183	.....	363	.....	183	36	.....	132	.....	3,230

NOTE.—Daily discharge determined by means of a discharge rating curve poorly defined up to 36 second-feet (gage height 2.2 feet), well defined between 47 and 2,150 second-feet (gage height 2.3 and 6.5 feet), and poorly defined above 2,230 second-feet (gage height 6.6 feet). No notes relative to ice were kept by the gage observer during 1907 and 1908. From a study of climatologic data for the winter periods it appears that the relation of gage height to discharge was not affected by ice during 1907 and 1908. Daily discharge determinations for November, 1908, are probably much too high.

Daily discharge Jan. 30 to Feb. 5, 1909 and Dec. 19 to 31, 1909, estimated because of ice, from climatologic records and runoff in adjacent drainage areas. Mean discharge Dec. 19 to 31, 1909, estimated 135 second-feet.

Daily discharge Jan. 1 and 2, Feb. 5 to 16, and Dec. 6 to 24, 1910, estimated, because of ice, from climatologic records, discharge of adjacent drainage areas, and gage observer's notes. Mean discharge Feb. 5 to 16, 1910, estimated about 833 second-feet, varying from about 400 to 3,000 second-feet. Mean discharge Dec. 6 to 24, 1910, estimated about 100 second-feet, varying from about 50 to 300 second-feet.

Monthly discharge of Tygart River at Belington, W. Va., for 1907–1910.

[Drainage area, 390 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1907.						
June 5-30	7,470	246	1,850	4.74	4.58	B.
July	16,500	363	1,840	4.72	5.44	B.
August	5,500	132	621	1.59	1.83	A.
September	1,070	132	365	.936	1.04	A.
October	2,150	110	596	1.53	1.76	A.
November	3,620	246	1,300	3.33	3.72	A.
December	4,730	321	1,360	3.49	4.02	A.
1908.						
January	7,230	694	1,680	4.31	4.97	A.
February	8,920	498	2,020	5.18	5.59	B.
March	8,190	595	1,890	4.85	5.59	A.
April	5,610	498	1,730	4.44	4.95	A.
May	6,520	498	2,320	5.95	6.86	B.
June	2,000	90	388	.995	1.11	A.
July	2,460	47	391	1.00	1.15	A.
August	246	18	83.8	.215	.25	B.
September	36	7	17.2	.044	.05	C.
October	12	7	7.35	.019	.02	D.
November	36	7	18.1	.046	.05	D.
December	183	26	84.2	.216	.25	C.
The year	8,920	7	884	2.27	30.84	
1909.						
January	2,540	156	552	1.42	1.64	B.
February	2,870	[a] 140	1,140	2.92	3.04	B.
March	3,230	407	1,150	2.95	3.40	A.
April	5,390	407	1,660	4.26	4.75	A.
May	1,560	183	557	1.43	1.65	A.
June	2,960	110	755	1.94	2.16	A.
July	3,520	47	217	.556	.64	A.
August	2,070	26	285	.731	.84	A.
September	1,700	59	244	.626	.70	A.
October	5,720	36	559	1.43	1.65	B.
November	2,960	132	493	1.26	1.41	A.
December	1,310	.....	276	.708	.82	C.
The year	5,720	.....	652	1.67	22.70	
1910.						
January	7,110	[b] 100	2,110	5.41	6.24	B.
February	4,410	.....	1,360	3.49	3.63	C.
March	1,370	183	437	1.12	1.29	A.
April	2,230	183	558	1.43	1.60	A.
May	3,710	246	680	1.74	2.01	A.
June	10,500	282	2,450	6.28	7.01	B.
July	1,440	90	402	1.03	1.19	A.
August	183	18	66.7	.171	.20	B.
September	321	36	114	.292	.33	A.
October	132	26	63.5	.163	.19	B.
November	1,370	47	148	.379	.42	B.
December	3,230	.....	568	1.46	1.68	D.
The year	10,500	18	740	1.90	25.79	

[a] February, 1909, minimum discharge estimated.
[b] January, 1910, minimum discharge estimated.

NOTE.—See footnotes to tables of daily discharge for notes relative to estimated periods.

TYGART RIVER AT FETTERMAN, W. VA.

This station, which is located at the highway bridge at Fetterman, W. Va., was established June 3, 1907, to obtain data for use in studying water-power, water-supply, pollution, flood-control, and storage problems.

Otter Creek is tributary from the west about three-fourths mile below the station.

The winters are mild; ice may exist for short periods during January, February, and December.

The records are reliable and accurate.

The datum of the chain gage attached to the bridge has not been changed.

Discharge measurements of Tygart River at Fetterman, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 18	C. T. Bailey	271	2,930	9.56	11,800
19	do	271	2,470	7.85	7,470
21	do	271	2,040	6.35	4,020
Aug. 20	do	65	61.2	3.05	[a] 70.1
Oct. 8	do	92	95.3	3.24	[a] 122

[a] Measurements Aug. 20 and Oct. 8 not at regular section.

Daily gage height, in feet, of Tygart River at Fetterman, W. Va., for 1910.

[Joseph Gerken, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.6	5.75	3.95	4.7	4.7	4.30	4.35	3.1	3.55	3.7	5.2
2	5.9	5.2	6.1	3.9	4.55	5.05	4.1	3.95	3.25	3.6	3.8	4.7
3	13.4	6.1	5.95	3.9	4.45	5.7	4.3	3.7	3.35	3.45	3.7	4.45
4	13.25	6.7	5.65	3.9	4.4	6.05	4.6	3.55	3.6	3.4	3.7	4.35
5	9.3	6.35	5.4	4.05	4.3	5.65	4.85	3.45	3.55	3.45	3.7	4.3
6	7.15	6.2	5.15	4.15	4.3	8.5	4.75	3.45	3.55	3.3	3.7	4.35
7	12.95	6.15	5.05	4.1	4.25	9.2	4.65	3.45	3.95	3.2	3.7	4.35
8	10.25	5.95	4.95	4.1	4.2	6.85	5.3	3.45	4.0	3.3	3.7	4.3
9	7.8	5.6	4.75	4.1	4.4	6.2	4.95	3.45	3.9	3.15	3.7	4.3
10	6.4	5.95	4.65	4.05	4.8	5.75	4.6	3.45	3.7	3.1	3.6	4.3
11	5.45	6.65	4.55	4.0	4.95	5.9	4.4	3.4	3.65	3.1	3.65	4.3
12	5.05	7.15	4.5	4.0	6.25	6.05	4.3	3.2	3.6	3.1	3.7	.....
13	5.0	8.05	4.45	4.0	8.9	6.5	4.35	3.15	3.65	3.1	3.7	.....
14	7.35	8.3	4.4	4.0	7.15	6.35	5.25	3.1	4.4	3.05	3.6	.....
15	8.25	8.15	4.35	4.2	5.9	6.0	5.45	3.05	4.15	3.05	3.5	.....
16	7.0	7.8	4.25	4.25	5.35	8.6	5.0	3.25	4.1	3.15	3.5	.....
17	6.1	9.7	4.2	4.2	5.0	14.5	4.7	3.2	3.9	3.1	3.5	4.1
18	9.3	9.45	4.2	4.35	4.85	11.35	4.55	3.1	3.75	3.1	3.45	.....
19	13.8	8.25	4.15	4.35	4.7	11.65	4.4	3.0	3.65	3.1	3.4	.....
20	10.05	7.4	4.1	4.45	4.6	12.7	4.35	2.9	3.55	3.1	3.4	.....
21	8.9	6.65	4.1	4.65	4.55	8.25	4.3	2.95	3.5	3.0	3.4	.....
22	9.95	8.9	4.1	4.95	4.5	6.65	4.1	2.9	3.45	3.0	3.4	.....
23	7.8	10.15	4.15	5.55	4.4	6.2	3.9	2.9	3.4	3.0	3.4	4.4
24	6.5	7.6	4.1	5.85	4.35	5.7	3.8	2.85	3.4	3.0	3.4	6.0
25	5.85	6.4	4.05	6.9	4.75	5.25	3.6	3.0	3.3	3.0	3.4	8.8
26	5.55	5.75	4.0	6.5	5.55	4.9	3.5	3.3	3.4	3.0	3.45	7.55
27	7.75	5.4	4.0	5.9	5.5	4.7	3.45	3.15	3.2	3.05	3.5	6.9
28	9.0	5.4	4.0	5.55	5.15	4.5	3.4	3.1	3.15	3.1	4.4	6.2
29	7.4	.....	4.0	5.2	4.9	4.35	3.35	3.05	3.05	3.1	5.9	5.7
30	6.5	.....	4.0	4.9	4.8	4.3	3.5	3.0	3.3	3.2	5.7	7.75
31	5.95	.....	4.0	.....	4.6	.....	4.15	3.0	.....	3.5	.....	9.15

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 and 2, Feb. 6 to 16, and Dec. 6 to 24. Ice reported 3 to 7 inches thick Dec. 10 to 24; river reported open Dec. 25.

Daily discharge, in second-feet, of Tygart River at Fetterman, W. Va., for 1907–1910.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1907.								1907.							
1	.....	2,080	1,040	802	607	2,150	1,570	16	8,910	2,330	525	653	1,110	1,740	9,200
2	.....	4,100	916	750	607	2,680	1,400	17	4,460	16,600	525	566	1,020	1,400	5,370
3	3,030	4,640	802	750	607	6,110	1,320	16	3,030	33,600	525	653	859	1,180	3,830
4	2,850	2,680	802	750	607	6,760	1,110	19	2,250	23,300	653	1,900	654	1,820	3,120
5	2,590	1,650	653	1,250	3,650	5,280	1,040	20	1,400	9,380	566	1,820	607	1,820	2,590
6	4,640	1,110	1,250	1,820	6,110	4,730	859	21	1,320	4,910	488	1,110	607	1,820	1,900
7	4,190	1,110	1,180	1,180	2,770	8,820	802	22	1,110	2,850	451	1,040	607	1,650	1,740
8	3,650	978	916	916	3,030	9,000	699	23	1,110	2,590	653	916	525	1,480	3,120
9	12,700	1,480	1,040	750	8,440	6,480	978	24	1,040	3,290	8,340	978	525	4,640	8,630
10	8,630	9,290	2,250	1,040	5,000	5,460	4,910	25	2,590	4,370	13,300	859	451	7,220	7,780
11	4,100	7,690	3,740	1,320	2,850	5,190	14,600	26	1,110	3,120	9,290	802	384	5,740	4,460
12	3,560	7,500	1,900	1,740	2,080	4,640	7,970	27	1,040	3,120	3,920	653	451	4,280	2,850
13	6,110	7,500	1,180	1,250	1,650	3,560	4,550	28	978	1,820	2,590	566	2,510	2,940	2,590
14	18,000	5,740	859	978	1,400	2,680	7,220	29	750	1,110	1,650	607	6,660	2,590	2,510
15	16,400	3,380	653	859	1,250	2,080	10,900	30	802	1,480	1,400	699	4,550	1,990	2,250
								31	.....	1,570	978	.....	3,120	.....	2,420

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.												
1	2,510	2,770	3,470	12,900	1,250	2,850	268	859	118	25	16	32
2	2,420	2,680	18,100	11,500	1,400	1,820	268	418	103	25	16	32
3	2,080	2,770	13,000	8,250	1,740	1,400	268	296	118	22	14	32
4	1,900	3,380	7,590	5,740	3,030	1,480	218	268	118	20	12	36
5	1,990	3,830	4,820	3,470	16,700	2,510	268	268	103	20	12	40
6	1,850	11,200	5,740	2,940	17,300	2,680	802	243	92	20	12	50
7	1,740	7,970	9,480	2,420	14,100	1,570	859	218	80	20	12	56
8	1,740	4,640	7,970	2,510	18,300	1,110	750	384	77	18	12	80
9	1,400	3,030	15,300	7,870	12,100	916	607	525	66	16	12	80
10	1,250	2,680	11,300	8,250	16,300	699	488	323	63	16	12	63
11	1,320	2,250	7,690	10,300	14,700	681	384	296	60	16	16	63
12	8,720	3,120	4,820	13,400	8,250	625	268	296	53	18	16	118
13	19,800	9,290	3,830	8,820	4,100	607	296	268	50	22	16	296
14	11,400	12,200	3,120	4,640	3,210	488	488	268	50	22	16	354
15	5,370	17,900	2,850	3,290	3,120	525	488	268	45	20	18	418
16	4,010	20,300	2,680	3,290	2,680	978	418	243	40	20	20	525
17	3,470	10,300	2,680	4,370	3,470	1,110	418	218	40	20	20	418
18	2,940	5,090	2,590	4,820	3,290	699	607	218	32	20	20	323
19	2,770	4,550	8,820	4,100	4,730	566	978	218	32	18	20	296
20	2,080	5,550	10,000	5,000	6,480	488	1,040	195	32	16	20	384
21	1,820	4,370	6,660	5,190	14,100	418	653	172	32	16	22	323
22	2,160	3,380	4,640	3,470	9,200	384	566	172	32	16	25	354
23	3,240	2,940	3,380	2,510	5,830	418	978	153	32	16	25	354
24	3,290	2,420	3,210	2,080	4,010	525	1,320	134	32	16	25	323
25	2,330	2,160	2,850	1,820	3,030	488	2,080	134	32	16	25	323
26	2,160	3,030	2,510	1,570	3,290	451	4,820	134	32	14	32	296
27	6,200	4,010	2,330	1,400	2,770	418	6,200	134	32	12	32	268
28	7,130	3,380	2,080	1,320	2,080	384	4,100	103	32	12	32	268
29	5,190	2,850	2,850	2,770	1,480	354	2,770	103	28	14	32	243
30	3,560	.....	6,760	1,040	1,110	323	1,990	92	25	16	32	243
31	2,680	.....	9,480	.....	4,640	.....	1,570	80	.....	16	.....	296
1909.												
1	384	750	3,290	3,210	6,570	525	978	2,940	218	384	802	802
2	699	670	2,940	2,940	10,300	451	802	1,480	218	384	750	750
3	859	600	3,830	3,210	8,530	566	653	1,250	243	354	653	653
4	916	750	7,220	3,290	5,190	566	566	1,040	296	296	607	607
5	978	900	5,830	4,820	3,830	1,180	451	607	323	268	607	607
6	916	1,900	4,460	5,370	3,020	3,650	354	451	243	218	566	566
7	699	2,940	4,460	4,550	2,770	1,990	296	384	218	218	525	566
8	978	3,030	6,110	3,210	2,160	2,080	218	323	218	172	451	653
9	1,180	2,940	5,920	2,680	1,570	5,650	195	296	218	172	451	607
10	859	6,200	5,090	2,420	1,480	4,550	172	268	1,400	172	2,940	488
11	916	8,440	4,730	1,900	1,740	9,000	172	218	2,590	172	7,220	451
12	1,180	5,000	3,740	1,570	1,650	5,000	195	218	1,480	384	3,920	607
13	1,110	3,920	2,940	1,480	1,570	3,470	268	195	978	916	2,680	699
14	1,040	3,470	2,850	9,670	1,480	2,510	243	153	607	859	2,080	2,080
15	6,660	3,470	3,210	14,000	1,320	3,120	195	153	488	802	1,650	3,290

Daily discharge, in second-feet, of Tygart River at Fetterman, W. Va., for 1907–1910—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
16	10,200	9,670	3,030	6,850	1,110	3,210	243	268	418	607	1,250	3,120
17	8,910	8,530	2,590	4,370	978	2,250	323	802	4,550	451	1,040	2,080
18	6,480	6,010	2,250	2,940	699	10,700	296	1,900	1,400	653	916	1,570
19	3,380	4,640	1,740	2,510	488	5,920	268	1,320	1,040	653	916	1,180
20	2,940	3,920	1,650	3,740	525	3,290	195	802	750	1,570	750	978
21	2,590	3,470	1,570	7,590	566	2,160	172	699	451	1,990	653	.....
22	2,330	4,370	1,320	13,900	653	1,250	153	1,180	384	1,740	566	.....
23	2,080	4,550	1,250	13,000	699	1,040	134	802	323	3,210	525	.....
24	2,330	8,160	978	9,580	699	859	134	607	451	16,700	802	.....
25	2,420	11,100	1,110	7,780	653	750	243	451	1,320	13,300	1,320	.....
26	1,480	6,760	1,400	6,480	525	653	451	354	1,180	6,940	1,320	.....
27	1,250	4,820	2,850	4,280	607	607	653	296	699	4,100	1,110	.....
28	1,040	3,830	3,920	3,650	1,040	1,650	451	218	607	2,330	916	.....
29	950	.....	4,640	3,120	859	1,990	323	1,250	488	1,650	859	.....
30	900	.....	4,550	3,650	653	1,180	653	750	451	1,250	802	.....
31	820	.....	4,280	.....	566	.....	3,920	243	.....	1,110	.....	.....
1910.												
1	500	2,850	3,120	488	1,320	1,320	802	859	80	243	323	2,160
2	2,500	2,160	3,740	451	1,110	1,900	607	488	118	268	384	1,320
3	18,200	3,740	3,470	451	978	3,030	802	323	153	195	323	978
4	17,900	4,820	2,940	451	916	3,650	1,180	243	268	172	323	859
5	9,670	4,190	2,510	566	802	2,940	1,570	195	243	195	323	802
6	5,650	.....	2,080	653	802	8,160	1,400	195	243	134	323	.....
7	17,200	.....	1,910	607	750	9,480	1,250	195	488	103	323	.....
8	11,500	.....	1,740	607	699	5,090	2,330	195	525	134	323	.....
9	6,850	.....	1,400	607	916	3,920	1,740	195	451	92	323	.....
10	4,280	.....	1,250	566	1,480	3,120	1,180	195	323	80	268	.....
11	2,590	.....	1,110	525	1,740	3,380	916	172	296	80	296	.....
12	1,900	.....	1,040	525	4,010	3,650	802	103	268	80	323	.....
13	1,820	.....	978	525	8,910	4,460	859	92	296	80	323	.....
14	6,010	.....	916	525	5,650	4,190	2,250	80	916	72	268	.....
15	7,690	.....	859	699	3,380	3,560	2,590	72	653	72	218	.....
16	5,370	.....	750	750	2,420	8,340	1,820	118	607	92	218	.....
17	3,740	10,400	699	699	1,820	20,800	1,320	103	451	80	218	.....
18	9,670	9,960	699	859	1,570	13,700	1,110	80	354	80	195	.....
19	19,100	7,690	653	859	1,320	14,300	916	63	296	80	172	.....
20	11,100	6,110	607	978	1,180	16,600	859	50	243	80	172	.....
21	8,910	4,730	607	1,250	1,110	7,690	802	56	218	63	172	.....
22	10,900	8,910	607	1,740	1,040	4,730	607	50	195	63	172	.....
23	6,850	11,300	653	2,770	916	3,920	451	50	172	63	172	.....
24	4,460	6,480	607	3,290	859	3,030	384	45	172	63	172	.....
25	3,290	4,280	566	5,190	1,400	2,250	268	63	134	63	172	8,720
26	2,770	3,120	525	4,460	2,770	1,650	218	134	172	63	195	6,380
27	6,760	2,510	525	3,380	2,680	1,320	195	92	103	72	218	5,190
28	9,100	2,510	525	2,770	2,080	1,040	172	80	92	80	916	3,920
29	6,110	.....	525	2,160	1,650	859	153	72	72	80	3,380	3,030
30	4,460	.....	525	1,650	1,480	802	218	63	134	103	3,030	6,760
31	3,470	.....	525	.....	1,180	.....	653	63	.....	218	.....	9,380

NOTE.—Daily discharge determined by means of a discharge rating curve that is fairly well defined below discharge 50 second-feet (gage height 2.9 feet), well defined between discharges 63 and 5,370 second-feet (gage heights 3.0 and 7.0 feet), and fairly well defined above discharge 5,550 second-feet (gage height 7.1 feet). Above discharge 24,300 second-feet (gage height 16 feet) the rating curve is extended on a tangent. No notes in regard to ice were kept by the gage observer during 1907 and 1908. From a study of climatologic data for the winter periods it appears that the relation of gage height to discharge was not affected by ice during 1907 and 1908.

Daily discharge Jan. 29 to Feb. 5, 1909, and Dec. 21 to 31, 1909, estimated because of ice, from climatologic records, run-off in adjacent drainage areas, and observer's notes.

Mean discharge Dec. 21 to 31, 1909, estimated about 446 second-feet, varying from about 150 to 750 second-feet.

Daily discharge Jan. 1 and 2, Feb. 6 to 15, and Dec. 6 to 24, 1910, estimated, because of ice, on basis of climatologic records, discharge of adjacent drainage areas, and gage observer's notes. Mean discharge Feb. 6 to 16, 1910, estimated about 2,240 second-feet, varying from about 1,400 to 4,000 second-feet. Mean discharge Dec. 6 to 24, 1910, estimated about 463 second-feet, varying from about 250 to 1,800 second-feet.

Monthly discharge of Tygart River at Fetterman, W. Va., for 1907–1910.

[Drainage area, 1,340 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1907.						
June 3-30	18,000	750	4,370	3.26	3.40	B.
July	33,600	978	5,690	4.25	4.90	B.
August	13,300	451	2,100	1.57	1.81	A.
September	1,900	566	999	.746	.83	A.
October	8,440	384	2,110	1.57	1.81	A.
November	9,000	1,180	3,940	2.94	3.28	A.
December	14,600	699	4,010	2.99	3.45	A.
1908.						
January	19,800	1,250	3,860	2.88	3.32	A.
February	20,300	2,160	5,660	4.22	4.55	A.
March	18,100	2,080	6,210	4.63	5.34	B.
April	13,400	1,040	5,040	3.76	4.20	A.
May	18,300	1,110	6,700	5.00	5.76	B.
June	2,850	323	932	.696	.78	A.
July	6,200	218	1,200	.896	1.03	A.
August	859	80	248	.185	.21	B.
September	118	25	56.0	.042	.05	C.
October	25	12	18.0	.013	.01	D.
November	32	12	19.8	.015	.02	D.
December	525	32	225	.168	.19	C.
The year	20,300	12	2,510	1.87	25.46	
1909.						
January	10,200	384	2,240	1.67	1.92	B.
February	11,100	[a] 600	4,460	3.33	3.47	B.
March	7,220	978	3,410	2.54	2.93	A.
April	14,000	1,480	5,260	3.93	4.38	A.
May	10,300	488	2,080	1.55	1.79	A.
June	10,700	451	2,730	2.04	2.28	A.
July	3,920	134	464	.346	.40	A.
August	2,940	153	707	.528	.61	A.
September	4,550	218	808	.603	.67	A.
October	16,700	172	2,070	1.54	1.78	A.
November	7,220	451	1,320	.985	1.10	A.
December	3,290	.....	880	.657	.76	B.
The year	16,700	.....	2,180	1.63	22.09	
1910.						
January	18,200	[b] 500	7,430	5.54	6.39	B.
February	11,300	.....	4,300	3.21	3.34	B.
March	3,740	525	1,250	.933	1.08	A.
April	5,190	451	1,370	1.02	1.14	A.
May	8,910	699	1,900	1.42	1.64	A.
June	20,800	802	5,430	4.05	4.52	A.
July	2,590	153	981	.732	.84	A.
August	859	45	154	.115	.13	A.
September	916	72	291	.217	.24	A.
October	268	63	108	.081	.09	A.
November	3,380	172	475	.354	.40	A.
December	9,380	.....	1,820	1.36	1.57	C.
The year	20,800	45	2,110	1.57	21.38	

[a] February, 1909, minimum discharge estimated.
[b] January, 1910, minimum discharge estimated.

NOTE.—See footnotes to table of daily discharge for notes relative to estimated periods.

WEST FORK RIVER AT ENTERPRISE, W. VA.

This station, which is located at the highway bridge at Enterprise, W. Va., was established June 2, 1907.

Binghamton Creek is tributary from the west about 1 mile below the station.

Winters are mild and ice exists only for short periods, if at all.

A small dam is located at Worthington about 3 miles below the station, but backwater does not reach to the section, for, from December 5 to 12, 1908, when the gates at the dam were opened to let water out of the pond, no effect was produced at the gage. The gage reader states that during the summer of 1908 the only water running in the river was the pumpage from the numerous coal mines along the stream.

The datum of the chain gage, attached to the bridge, has remained unchanged. The records are reliable and accurate.

Discharge measurements of West Fork River at Enterprise, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 18	C. T. Bailey	168	1,060	6,35	3,850
19	do	164	808	4.90	2,240
19	do	164	794	4.83	1,990
22	do	205	1,360	7.92	5,720
22	do	207	1,570	8.90	7,170
Aug. 17	do	67	47.9	0.65	11.2
Oct. 8	do	52	36.7	0.80	22.0

Daily gage height, in feet, of West Fork River at Enterprise, W. Va., for 1910.

[Charles M. Tetrick, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.8	4.9	1.5	1.9	2.2	1.5	1.4	1.1	1.1	2.0	3.3
2	.....	3.3	4.5	1.5	1.8	2.3	1.5	1.2	1.0	1.0	2.0	2.7
3	9.4	4.0	4.1	1.5	1.7	2.5	2.0	1.1	2.6	0.9	1.8	2.3
4	8.8	5.5	3.7	1.6	1.6	2.4	3.5	1.1	2.4	.9	1.7	2.3
5	5.2	5.4	3.2	1.7	1.6	2.2	2.2	1.0	2.9	.9	1.6	2.2
6	5.0	5.0	3.0	1.6	1.5	6.0	2.0	1.0	2.6	.9	1.4	2.8
7	11.8	3.7	2.8	1.6	1.5	6.0	3.3	0.9	2.8	.8	1.3	2.7
8	7.2	3.7	2.6	1.6	1.5	4.6	3.3	0.9	2.6	.8	1.3	2.6
9	5.0	3.1	2.4	1.6	1.6	3.5	3.2	0.8	2.2	.8	1.2	2.9
10	3.6	3.6	2.3	1.5	1.5	3.0	2.6	1.0	1.9	.8	1.1	3.2
11	4.2	4.3	2.2	1.4	2.4	2.6	2.0	1.0	1.8	.8	1.3	2.2
12	3.7	5.0	2.2	1.4	2.8	4.0	2.2	.9	2.6	.8	1.7	3.2
13	3.0	.....	2.1	1.4	7.5	2.9	2.6	.9	2.4	.8	1.7	3.1
14	9.7	5.8	2.0	1.4	3.8	2.4	4.0	.8	6.5	.8	1.7	3.0
15	8.0	5.7	2.0	1.4	3.0	2.5	3.3	.7	5.0	.8	1.7	2.8
16	6.1	7.8	1.9	1.4	2.4	2.6	2.6	.7	3.7	.8	1.6	2.8
17	4.1	9.1	1.9	1.4	2.3	3.7	2.2	.7	2.5	.8	1.6	2.7
18	9.6	6.8	1.9	1.5	2.8	3.0	2.1	.7	2.2	.8	1.5	2.6
19	13.6	4.8	1.8	1.5	2.4	5.0	2.0	.8	2.0	.8	1.5	3.0
20	6.9	4.0	1.8	1.5	2.3	4.0	2.0	.8	1.9	.8	1.3	5.6
21	6.7	4.6	1.7	1.5	2.2	3.9	1.8	.7	1.7	1.8	1.3	5.0
22	10.4	7.7	1.7	1.8	2.1	2.7	1.6	.7	1.5	1.0	1.2	4.0
23	6.4	8.6	1.7	2.1	2.4	2.3	1.5	.8	1.4	1.8	1.3	3.5
24	4.6	5.5	1.7	2.0	2.2	2.0	1.4	1.0	1.3	1.6	1.2	7.0
25	4.0	3.9	1.7	1.8	2.1	1.7	1.3	1.0	1.2	1.5	1.7	8.0
26	4.0	3.4	1.6	2.6	3.6	1.6	1.3	1.0	1.1	1.7	1.6	4.7
27	8.2	3.3	1.6	2.3	3.2	1.5	1.1	.9	1.0	1.5	1.5	3.7
28	9.2	3.2	1.6	2.2	2.9	1.7	1.0	.9	1.0	1.5	1.9	3.2
29	5.9	.....	1.5	2.1	2.6	1.5	1.3	.8	1.9	1.6	5.8	4.5
30	4.8	.....	1.5	2.0	2.4	1.5	1.3	.7	1.5	1.5	4.7	6.8
31	4.0	.....	1.5	.....	2.3	.....	1.3	.7	.....	1.4	.....	6.5

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 and 2, Feb. 10 to 15, and Dec. 6 to 19.

Daily discharge, in second-feet, of West Fork River at Enterprise, W. Va., for 1907–1910.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1907.								1907.							
1	.....	99	266	227	227	1,090	489	16	1,760	649	227	441	266	307	4,200
2	2,090	707	227	190	227	5,740	395	17	1,030	441	190	266	227	226	3,460
3	2,010	1,300	227	155	266	3,460	350	18	649	7,060	155	227	190	395	2,270
4	1,230	1,090	190	540	307	2,650	307	19	489	5,860	227	707	190	1,090	1,380
5	829	767	190	441	1,920	2,180	266	20	395	2,090	350	767	155	1,030	1,230
6	1,090	227	190	350	1,380	1,840	227	21	350	1,530	266	489	155	893	1,030
7	1,030	1,030	350	227	1,030	1,530	227	22	307	767	227	395	124	707	707
8	829	1,030	307	190	1,600	1,380	190	23	227	1,840	707	307	99	593	593
9	2,010	5,740	227	155	1,090	1,160	266	24	155	1,230	5,510	266	79	8,280	2,010
10	1,760	2,180	1,530	124	829	1,030	489	25	99	1,030	3,990	227	64	5,860	1,380
11	893	7,180	1,090	1,760	707	767	7,300	26	124	1,230	2,750	227	64	2,550	1,230
12	649	4,740	649	3,670	593	593	4,740	27	124	767	1,530	227	79	1,760	1,030
13	2,270	2,010	441	1,760	489	395	3,150	28	124	540	1,030	155	1,090	829	767
14	6,940	829	266	707	350	350	5,860	29	155	350	489	190	2,550	707	649
15	3,560	707	227	593	266	307	6,460	30	99	307	395	227	1,760	540	707
								31	.....	227	266	.....	893	.....	489

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.												
1	395	1,230	6,460	6,080	227	395	99	190	30	20	20	20
2	350	1,090	12,800	8,160	707	307	64	155	25	16	20	20
3	307	959	5,290	5,290	489	227	52	441	20	20	20	20
4	227	893	3,670	3,560	2,180	190	43	227	16	20	20	20
5	707	14,100	2,180	1,680	16,000	155	36	99	20	20	20	20
6	593	4,960	3,150	1,030	9,400	124	36	489	20	25	20	20
7	540	2,650	2,550	959	8,280	99	36	266	20	20	20	20
8	489	1,840	2,180	829	5,510	79	155	227	20	20	20	20
9	1,530	1,530	12,100	3,990	7,670	79	99	190	16	20	20	52
10	1,380	1,380	7,180	3,460	7,060	64	64	155	12	16	20	36
11	1,530	1,160	3,460	3,670	4,310	52	52	99	25	20	20	30
12	1,840	893	1,920	2,650	2,360	43	43	64	20	20	20	30
13	7,550	767	1,450	1,760	1,380	30	36	52	16	20	20	36
14	4,850	707	1,160	1,380	829	30	99	52	12	20	20	30
15	2,360	5,620	1,030	1,160	767	767	64	43	16	20	20	43
16	2,010	5,290	893	893	593	489	79	36	16	20	20	36
17	1,760	3,560	767	829	829	307	52	52	25	20	20	30
18	1,450	1,600	707	829	1,300	227	593	36	25	20	20	25
19	1,230	1,380	9,900	707	2,460	190	227	30	25	20	20	43
20	959	3,250	4,850	649	2,270	124	649	30	20	20	20	36
21	767	2,180	2,270	767	8,400	79	307	25	20	20	20	36
22	707	1,760	1,760	540	2,750	64	227	30	25	20	20	43
23	649	1,380	1,300	441	1,920	52	155	36	20	25	20	36
24	593	1,230	959	395	1,380	43	79	30	16	25	20	36
25	593	1,090	767	350	1,160	52	64	25	12	25	20	30
26	1,030	2,850	959	307	1,090	43	99	25	20	25	20	30
27	3,880	2,360	829	307	1,030	36	441	20	25	25	20	99
28	2,180	2,010	707	266	707	36	350	20	20	25	20	52
29	1,840	1,760	3,670	227	593	190	266	20	16	20	20	43
30	1,530	.....	4,200	190	441	124	227	20	20	20	20	36
31	1,380	.....	4,200	.....	350	.....	227	16	.....	20	.....	30
1909.												
1	52	400	2,010	1,230	6,320	190	489	99	52	43	99	79
2	36	380	1,680	959	4,200	155	350	79	43	43	79	79
3	99	350	1,030	707	2,360	155	190	64	43	36	79	79
4	155	700	1,090	893	1,760	155	52	52	43	30	79	79
5	155	1,200	3,360	1,230	1,230	395	79	43	43	30	99	79
6	190	1,380	1,530	959	829	350	79	64	36	25	79	64
7	155	1,300	1,380	707	593	441	64	52	36	25	79	79
8	124	1,230	1,230	540	441	395	52	43	36	30	64	99
9	124	1,600	1,160	441	350	6,580	43	36	36	25	64	124
10	99	5,620	1,030	350	307	2,010	36	30	190	25	79	227
11	79	3,990	1,680	307	266	2,460	36	25	1,600	25	1,600	155
12	350	2,360	1,230	266	227	2,010	30	20	829	43	893	3,560
11	155	2,010	1,090	266	190	1,760	79	20	307	79	441	1,840
14	124	1,600	959	3,880	190	893	124	20	155	64	307	1,030
15	5,860	1,300	649	2,750	124	1,600	155	43	99	64	227	767

Daily discharge, in second-feet, of West Fork River at Enterprise, W. Va., for 1907–1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
16	3,560	8,780	489	1,680	124	1,030	227	227	79	64	190	649
17	2,010	5,620	1,600	893	124	593	190	441	64	64	155	593
18	3,560	1,230	1,380	707	99	4,310	124	227	52	79	124	500
19	1,450	1,600	1,160	593	79	3,780	155	190	43	64	99	390
20	893	2,010	829	893	79	2,650	124	124	43	64	99	280
21	593	1,230	649	6,940	190	707	79	959	43	64	79	200
22	540	2,180	1,680	8,040	489	489	64	540	36	64	79	150
23	395	1,600	1,230	6,820	307	540	52	350	36	99	79	120
24	1,600	7,670	1,030	4,310	227	489	43	155	36	4,420	79	110
25	1,300	5,180	829	2,550	155	489	79	99	79	3,560	99	110
26	959	3,050	707	1,840	124	441	124	64	43	1,230	155	100
27	707	2,010	649	1,380	227	1,530	99	52	36	593	124	100
28	593	2,460	593	1,030	441	6,820	79	43	64	350	99	80
29	520	.....	1,600	707	350	1,680	64	36	43	307	99	80
30	460	.....	1,300	593	307	893	99	52	52	155	99	80
31	420	.....	1,090	.....	266	.....	124	52	.....	155	.....	80
1910.												
1	300	1,230	2,090	79	190	307	79	64	36	36	227	893
2	1,000	893	1,760	79	155	350	79	43	30	30	227	540
3	6,940	1,380	1,450	79	124	441	227	36	489	25	155	350
4	6,200	2,650	1,160	99	99	395	1,030	36	395	25	124	350
5	2,360	2,550	829	124	99	307	307	30	649	25	99	307
6	2,180	2,180	707	99	79	3,150	227	30	489	25	64	270
7	9,900	1,160	593	99	79	3,150	893	25	593	20	52	250
8	4,420	1,160	489	99	79	1,840	893	25	489	20	52	230
9	2,180	767	395	99	99	1,030	829	20	307	20	43	230
10	1,090	950	350	79	79	707	489	30	190	20	36	220
11	1,530	1,200	307	64	395	489	227	30	155	20	52	220
12	1,160	1,000	307	64	593	1,380	307	25	489	20	124	210
13	707	800	266	64	4,740	649	489	25	395	20	124	210
14	7,300	800	227	64	1,230	395	1,380	20	3,670	20	124	200
15	5,290	1,500	227	64	707	441	893	16	2,180	20	124	200
16	3,250	5,070	190	64	395	489	489	16	1,160	20	99	200
17	1,450	6,580	190	64	350	1,160	307	16	441	20	99	150
18	7,180	3,990	190	79	593	707	266	16	307	20	79	150
19	12,200	2,010	155	79	395	2,180	227	20	227	20	79	200
20	4,090	1,380	155	79	350	1,380	227	20	190	20	52	2,750
21	3,880	1,840	124	79	307	1,300	155	16	124	155	52	2,180
22	8,160	4,960	124	155	266	540	99	16	79	30	43	1,380
23	3,560	5,970	124	266	395	350	79	20	64	155	52	1,030
24	1,840	2,650	124	227	307	227	64	30	52	99	43	4,200
25	1,380	1,300	124	155	266	124	52	30	43	79	124	5,290
26	1,380	959	99	489	1,090	99	52	30	36	124	99	1,920
27	5,510	893	99	350	829	79	36	25	30	79	79	1,160
28	6,700	829	99	307	649	124	30	25	30	79	190	829
29	3,050	.....	79	266	489	79	52	20	190	99	2,950	1,760
30	2,010	.....	79	227	395	79	52	16	79	79	1,920	3,990
31	1,380	.....	79	.....	350	.....	52	16	.....	64	.....	3,670

NOTE.—Daily discharge determined by means of a discharge rating curve that is fairly well defined below 649 second-feet (gage height 2.9 feet), well defined between 707 and 2,180 second-feet (gage heights 3.0 and 5.0 feet), fairly well defined between 2,270 and 6,460 second-feet (gage heights 5.1 and 9.0 feet), and is an extension above 6,460 second-feet (gage height 9.0 feet). No notes in regard to ice were kept by the gage observer during 1907 and 1908. From a study of climatologic data for the winter periods it appears that the relation of gage height to discharge was not affected by ice during 1907 and 1908. Daily discharge Jan. 29 to Feb. 5, 1909, and Dec. 18 to 31, 1909, estimated, because of ice, from climatologic records, run-off in adjacent drainage areas, and gage observer's notes. Mean discharge Dec. 18 to 31, 1909, estimated about 170 second-feet, varying from about 80 to 500 second-feet. Daily discharge Jan. 1 and Feb. 2, 10 to 15, and Dec. 6 to 19, 1910, estimated, because of ice, from climatologic records, discharge of adjacent drainage areas, and observer's notes. Mean discharge Dec. 6 to 19, 1910, estimated about 210 second-feet, varying from about 150 to 270 second-feet.

Monthly discharge of West Fork River at Enterprise, W. Va., for 1907–1910.

[Drainage area, 750 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1907.						
June 2-30	6,940	99	1,150	1.53	1.65	A.
July	7,180	99	1,790	2.39	2.76	B.
August	5,510	155	796	1.06	1.22	A.
September	3,670	124	540	.720	.81	A.
October	2,550	64	621	.828	.95	A.
November	8,280	226	1,670	2.23	2.49	A.
December	7,300	190	1,740	2.32	2.68	A.
1908.						
January	7,550	227	1,520	2.03	2.34	A.
February	14,100	707	2,460	3.28	3.54	B.
March	12,800	707	3,400	4.53	5.22	B.
April	8,160	190	1,780	2.37	2.64	A.
May	16,000	227	3,050	4.07	4.69	B.
June	767	30	157	.209	.23	A.
July	649	36	162	.216	.25	A.
August	489	16	103	.137	.16	B.
September	30	12	19.8	.026	.03	C.
October	25	16	20.9	.028	.03	D.
November	20	20	20.0	.027	.03	D.
December	99	20	34.1	.046	.05	C.
The year	16,000	12	1,060	1.41	19.21	
1909.						
January	5,860	36	881	1.17	1.35	B.
February	8,780	[a] 350	2,500	3.33	3.47	B.
March	3,360	489	1,220	1.63	1.88	A.
April	8,040	266	1,820	2.43	2.71	B.
May	6,320	79	741	.988	1.14	A.
June	6,820	155	1,530	2.04	2.28	A.
July	489	30	116	.155	.18	A.
August	959	20	139	.185	.21	A.
September	1,600	36	143	.191	.21	A.
October	4,420	25	384	.512	.59	A.
November	1,600	64	198	.264	.29	A.
December	3,560	64	386	.515	.59	C.
The year	8,780	20	824	1.10	14.90	
1910.						
January	12,200	[a] 300	3,860	5.15	5.94	B.
February	6,580	767	2,090	2.79	2.90	B.
March	2,090	79	426	.568	.65	A.
April	489	64	138	.184	.21	A.
May	4,740	79	522	.696	.80	A.
June	3,150	79	798	1.06	1.18	A.
July	1,380	30	342	.456	.53	A.
August	64	16	25.4	.034	.04	B.
September	3,670	30	454	.605	.68	A.
October	155	20	48.0	.064	.07	A.
November	2,950	36	253	.337	.38	A.
December	5,290	.....	1,150	1.53	1.76	C.
The year	12,200	16	836	1,11	15.14	

[a] Estimated.

NOTE.—See footnotes to tables of daily discharge for notes relative to periods for which discharge was estimated.

CHEAT RIVER NEAR MORGANTOWN, W. VA.

This station, which was maintained from July 8 to December 30, 1899, July 1 to December 29, 1900, and August 21, 1902, to December 31, 1905, was reestablished November 18, 1908, by F. W. Scheidenhelm, through whose courtesy the 1910 gage heights have been furnished to the United States Geological Survey for publication.

The staff gage for this station was originally located about 100 feet above the present location of Ice's ferry bridge at Uneva, W. Va., about 6 miles northeast of Morgantown and 10 miles above the mouth of Cheat River. The 1899 measurement was made from a cable which was located at the gage. During 1900 the cable was moved downstream about 1 mile and all subsequent measurements were made at the new cable location except those stated to have been made at wading sections or at Ice's ferry bridge. The first four measurements made during 1899 to 1901 were referred to the staff gage immediately above the present location of Ice's ferry bridge.

On August 20, 1902, a new inclined and vertical staff gage was installed about 275 feet below the new cable section. The readings were made on the inclined section below 6.5 feet. The new gage was set to read the same as the original gage at 1.8 feet. On September 28, 1904, the inclined portion of this staff gage was found to be 0.35 foot too high and the vertical section 0.15 foot too high. Both sections were accordingly lowered. On September 28, 1904, a chain gage was established on Ice's ferry bridge to read the same as the second staff gage at 1.85 feet. The length of chain is 41.01 feet. Both gages were maintained from September 28, 1904, to December 31, 1905. The staff gage was maintained from November 18, 1908, to May 8, 1909, and the chain gage had been maintained from January 21, 1909, to date. From these simultaneous gage readings the following gage relation has been determined:

Relation of gages on Cheat River.

Chain gage.	Staff gage.	Chain gage.	Staff gage.
Feet.	*Feet.*	*Feet.*	*Feet.*
1.5	1.52	6.5	7.69
2.0	2.00	7.0	8.28
2.5	2.52	7.5	8.87
3.0	3.11	8.0	9.43
3.5	3.78	8.5	9.98
4.0	4.46	9.0	10.53
4.5	5.15	9.5	11.06
5.0	5.82	10.0	11.59
5.5	6.47	10.5	12.11
6.0	7.09	11.0	12.65

All discharge measurements and gage heights from 1902 to 1909, as published in Water-Supply Paper 263, are referred to the second staff gage. All gage heights from 1902 to September 28, 1904, have

been reduced to the gage zero established September 28, 1904. Gage heights previously published for 1899–1900 are referred to the original staff gage and are correct as originally published.

The original staff gage and the chain gage are located in a deep pool, with large islands about one-fourth mile above and below the station. The second staff gage is also located in a deep pool of somewhat smaller dimensions than at the original location. It is situated nearly one-fourth mile below a large island and a short distance above a small island. Both pools are controlled by permanent rock reefs. Water was diverted around the lower gage for milling prior to 1908 The quantity thus diverted was relatively small (see table of discharge measurements) except at low stages, and has been disregarded in the following computations of discharge, but should, however, be taken into consideration in making use of the tables to determine the run-off in the Cheat River drainage basin. No important tributaries enter Cheat River near the gaging station.

Large ice jams sometimes occur at this station. In January, 1904, the ice piled up from 8 to 10 feet above normal low-water stage, thus greatly affecting the relation of gage height to discharge. For the occurrence of other periods of ice effect, as determined by observer's records and climatologic reports, see footnotes to gage-height table.

The discharge for these periods has been estimated, and it is assumed that the open-channel rating applies for all other winter periods.

The curves developed are very satisfactory and the figures showing daily and monthly discharge given in Water-Supply Paper 263 are considered very good, with the possible exception of those for 1902–3, for which period there is some doubt about the elevation of the inclined gage. However, as the two measurements made during 1902–3 plot practically on the 1904–1909 discharge curve, when their gage heights are increased 0.35 foot, it is evident either that the inclined gage was set incorrectly at the time of its installation by the amount of the error in the gage (0.35 foot) discovered during 1904 or else that conditions of flow were different in these two years from what they have been since. In either event the correction of all gage heights for 1902–3 in accordance with the discrepancies found September 28, 1904, will yield essentially correct results for these years, and these corrections have accordingly been made.

The discharge for low stages during 1899–1900 is also somewhat open to question. It has been impossible as yet to determine the period when Ice's ferry bridge was erected. The somewhat conflicting statements obtained seem to indicate that the bridge was built during 1900 or 1901. In any event it is probable that both the measurements made during 1901 were affected by the backwater from the bridge. This backwater effect is, however, very slight at low stages, owing to the deep, wide pool in which the gage is located

The two rating curves probably converge to a common curve at some point above the stage of zero flow. Hence at low stages the 1899–1900 discharges may be too high.

The gage at this station was checked April 28, 1909, and the last discharge measurement in 1909 was made August 19. No discharge measurements were made during 1910. This station was visited October 7, 1911 (previous to the publication of this report), by H. P. Drake, an engineer of the Pittsburgh Hydro-Electric Co. From Mr. Drake's report the observed gage heights on the chain gage from April 28 to December 31, 1909, are in error to an extent ranging from 0.02 to 0.06 foot for gage heights below 10 feet, and 0.02 to 0.03 above 10 feet. The gage heights for 1910 in the following table are correct.

The accuracy of the daily and monthly discharges given in the following tables depends upon the permanency of the conditions of flow since August 19, 1909.

Daily gage height, in feet, of Cheat River near Morgantown, W. Va., for 1910.

[C. F. Baker, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.47	3.71	6.30	2.93	3.64	3.96	3.17	2.55	2.26	2.34	2.38	3.57
2	2.82	3.48	6.02	2.93	3.43	4.98	3.00	2.54	2.34	2.23	2.31	3.17
3	10.07	3.62	5.41	2.93	3.34	5.10	2.95	2.39	2.42	2.14	2.25	3.06
4	8.02	3.77	4.89	2.92	3.26	4.97	3.76	2.33	3.32	2.10	2.22	3.01
5	5.82	3.84	4.55	3.10	3.04	4.57	4.26	2.31	2.91	2.08	2.32	2.90
6	5.68	3.71	4.33	3.11	3.04	6.18	4.23	2.23	2.92	2.06	2.30	2.67
7	7.50	3.30	4.27	3.08	2.98	5.64	3.75	2.43	3.35	2.01	2.25	3.03
8	6.28	3.52	4.21	3.04	3.01	4.84	3.88	2.38	2.99	1.98	2.21	2.79
9	5.24	3.37	3.85	3.04	3.14	4.41	3.84	2.27	2.73	2.05	2.17	2.49
10	4.45	3.73	3.67	2.94	3.20	4.57	3.54	2.23	2.64	1.93	2.16	2.59
11	3.90	4.16	3.47	2.89	3.32	5.06	3.45	2.21	2.51	1.90	2.11	2.57
12	3.80	3.78	3.38	2.81	4.23	5.23	3.31	2.19	2.48	2.12	2.13	2.50
13	3.70	3.43	3.35	2.77	5.06	5.30	3.29	2.18	2.40	2.20	2.15	2.49
14	5.42	3.26	3.27	2.74	4.42	4.92	3.84	2.12	2.51	2.12	2.15	2.47
15	5.10	3.10	3.13	2.95	3.96	4.60	3.76	2.07	2.52	2.06	2.15	2.42
16	4.86	3.61	3.13	2.89	3.74	4.70	3.51	2.12	2.53	2.00	2.13	2.41
17	4.00	6.78	3.05	2.93	3.54	8.84	3.31	2.13	2.52	1.94	2.11	2.38
18	6.61	6.80	3.13	3.08	3.44	6.43	3.17	2.11	2.44	1.91	2.09	2.64
19	8.36	5.78	3.06	3.37	3.38	11.79	3.35	2.09	2.30	1.91	2.09	.....
20	5.88	4.98	3.01	3.47	3.26	7.71	3.15	2.07	2.22	1.87	2.05	2.78
21	5.52	4.95	3.00	3.71	3.26	5.68	2.99	2.06	2.16	1.88	2.03	2.88
22	6.07	7.04	3.19	4.19	3.24	5.47	2.87	1.97	2.13	1.89	2.04	2.63
23	5.30	6.63	3.23	4.27	3.16	4.71	2.77	1.94	2.13	1.92	2.09	2.68
24	4.50	5.28	3.15	4.45	3.14	4.21	2.63	2.13	2.12	1.92	2.13	4.28
25	4.20	4.59	3.13	4.82	3.38	3.95	2.59	2.07	2.10	1.95	2.22	3.88
26	3.87	4.14	3.15	4.80	4.04	3.74	2.53	2.04	2.04	2.33	2.73	3.48
27	4.48	4.07	3.17	4.67	3.79	3.45	2.48	2.06	1.98	2.23	3.19	3.28
28	4.96	4.95	3.07	4.52	3.54	3.38	2.43	2.04	1.97	2.20	3.05	3.03
29	4.50	.....	3.03	4.04	3.36	3.39	2.48	1.98	2.42	2.21	4.53	4.48
30	3.77	.....	3.00	3.86	3.24	3.39	2.49	1.94	2.36	2.37	4.17	7.38
31	3.83	.....	2.97	.....	3.22	.....	2.62	1.93	.....	2.47	.....	6.09

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 and 2, Feb. 8 to 15, and Dec. 7 to 29. Ice reported 7½ inches thick Jan. 1. Ice went out Jan. 2. Gage heights Dec. 12 to 29 read to top of ice, thickness of ice ranging from 4 to 7 inches. Ice went out at 4 p. m. Dec. 29.

Daily discharge, in second-feet, of Cheat River near Morgantown, W. Va., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	250	2,220	11,500	838	2,050	2,880	1,140	512	357	395	415	1,890
2	350	1,690	10,400	838	1,580	6,410	915	506	395	344	380	1,140
3	26,700	2,000	8,050	838	1,410	6,870	860	420	436	306	352	993
4	18,800	2,380	6,070	827	1,280	6,380	2,350	390	1,380	294	339	928
5	9,650	2,550	4,820	1,040	967	4,890	3,820	380	816	283	385	805
6	9,100	2,220	4,050	1,060	967	11,100	3,720	344	827	276	375	601
7	16,300	1,340	3,850	1,020	893	8,950	2,320	442	1,430	258	352	.....
8	11,400	1,200	3,650	967	928	5,890	2,660	415	904	248	334	.....
9	7,400	1,200	2,580	967	1,100	4,320	2,550	362	650	272	318	.....
10	4,460	1,600	2,130	849	1,180	4,890	1,820	344	577	230	314	.....
11	2,710	1,400	1,670	796	1,380	6,720	1,620	334	486	220	294	.....
12	2,450	1,200	1,480	720	3,720	7,400	1,360	326	469	298	302	.....
13	2,200	1,000	1,430	684	6,720	7,630	1,320	322	425	330	310	.....
14	8,090	1,000	1,290	659	4,360	6,190	2,550	298	486	298	310	.....
15	6,870	1,200	1,090	860	2,880	5,000	2,350	280	493	276	310	.....
16	5,960	1,980	1,090	796	2,300	5,370	1,750	298	500	255	302	.....
17	3,000	13,400	980	838	1,820	21,700	1,360	302	493	234	294	.....
18	12,700	13,500	1,090	1,020	1,600	12,000	1,140	294	447	224	286	.....
19	19,800	9,490	993	1,470	1,480	33,700	1,430	286	375	224	286	.....
20	9,880	6,410	928	1,670	1,280	17,100	1,120	280	339	211	272	.....
21	8,480	6,300	915	2,220	1,280	9,100	904	276	314	214	266	.....
22	10,600	14,500	1,170	3,590	1,250	8,280	776	244	302	217	269	.....
23	7,630	12,800	1,230	3,850	1,130	5,410	684	234	302	227	286	.....
24	4,640	7,550	1,120	4,460	1,100	3,650	569	302	298	227	302	.....
25	3,620	4,960	1,090	5,810	1,480	2,860	538	280	290	238	339	.....
26	2,630	3,430	1,120	5,740	3,120	2,300	500	269	269	390	650	.....
27	4,570	3,210	1,140	5,260	2,420	1,620	469	276	248	344	1,170	.....
28	6,340	6,300	1,010	4,710	1,820	1,480	442	269	244	330	980	.....
29	4,640	.....	954	3,120	1,450	1,500	469	248	436	334	4,750	.....
30	2,380	.....	915	2,610	1,250	1,500	474	234	405	410	3,520	15,800
31	2,530	.....	882	.....	1,220	.....	561	230	.....	464	.....	10,700

NOTE.—Daily discharge determined by means of a discharge rating curve that is well defined between 115 and 12,300 second-feet (gage heights 1.5 and 6.5 feet). Daily discharge Jan. 1 and 2, Feb. 8 to 15, and Dec. 7 to 29, estimated, because of ice, from climatologic records, discharge of adjacent drainage areas, and gage observer's notes. Mean discharge Dec. 7 to 29 estimated about 628 second-feet, varying from about 250 to 3,000 second-feet.

Monthly discharge of Cheat River near Morgantown, W. Va., for 1910.

[Drainage area, 1,380 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	26,700	[a] 250	7,620	5.52	6.36	B.
February	14,500	[a] 1,000	4,570	3.31	3.45	C.
March	11,500	882	2,600	1.88	2.17	A.
April	5,810	659	2,000	1.45	1.62	A.
May	6,720	893	1,820	1.32	1.52	A.
June	33,700	1,480	7,440	5.39	6.01	A.
July	3,820	442	1,440	1.04	1.20	A.
August	512	230	322	.233	.27	B.
September	1,430	244	513	.372	.42	A.
October	464	211	286	.207	.24	B.
November	4,750	266	635	.460	.51	B.
December	15,800	.....	1,530	1.11	1.28	D.
The year	33,700	.....	2,550	1.85	25.05	

[a] January and February minimum discharge estimated.

NOTE.—See footnotes to table of daily discharge for notes relative to periods during which discharge was estimated.

YOUGHIOGHENY RIVER AT CONFLUENCE, PA.

The Youghiogheny rises in Garrett County, Md., on the western slope of the Allegheny Mountains, at an elevation of about 2,900 feet, flows northwestward into Pennsylvania and joins Monongahela River about 15 miles above Pittsburgh. For 19 miles above its mouth the average fall of the stream is about 2 feet to the mile, but above that point it soon increases to an average fall of nearly 5 feet to the mile. The average width of the river from its mouth to West Newton, Pa., is about 546 feet.

The gaging station, which is located at a highway bridge about half a mile from the railroad station at Confluence, Pa., was established by the United States Geological Survey September 15, 1904. It is now maintained by the Water Supply Commission of Pennsylvania, by which records of gage height and discharge measurements are furnished.

No important tributaries enter above the station. Casselman River, draining an area approximately equal in size to that drained by the Youghiogheny, enters from the right about half a mile below the station, and a short distance farther downstream Laurel Hill Creek enters, also from the right. The drainage area of this creek is about one-fourth that of Youghiogheny above Confluence. The joining of these three tributaries to the main Youghiogheny River, together with the inadequate flood channel capacity of the main stream, causes gorging and backwater at high stages to a greater or less extent in all of them. From general conditions backwater is believed to occur occasionally at the Youghiogheny station, particularly at very high stages, although much less than at the Casselman and Laurel Hill stations. The relation of gage height to discharge is occasionally affected by ice.

The datum of the chain gage attached to the bridge has remained constant since the establishment of the station.

No discharge measurements were made at this station during 1910. The station was last inspected June 12, 1909, by F. W. Scheidenhelm. The accuracy of published estimates of daily and monthly discharge depends upon the permanency of the conditions of flow since that date.

Daily gage height, in feet, of Youghiogheny River at Confluence, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.25	2.95	7.05	1.95	2.7	3.0	2.25	1.6	1.6	1.35	1.4	1.8
2	3.35	2.85	6.4	1.95	2.55	3.9	2.25	1.6	1.7	1.35	1.45	1.8
3	10.8	2.9	5.4	1.9	2.45	3.9	2.2	1.55	1.7	1.35	1.45	1.8
4	7.35	2.85	4.85	1.9	2.35	3.6	2.15	1.55	2.15	1.3	1.45	1.8
5	4.65	2.55	4.55	1.95	2.3	3.85	2.1	1.5	2.15	1.3	1.45	1.8
6	4.85	2.2	4.4	1.95	2.3	4.6	2.1	1.5	1.8	1.3	1.4	1.9
7	5.3	2.0	3.9	1.9	2.25	3.95	2.05	1.5	1.75	1.3	1.4	1.9
8	4.95	2.0	3.5	1.9	2.2	3.35	2.0	1.5	1.7	1.35	1.4	1.9
9	3.9	2.5	3.2	1.9	2.3	3.25	2.1	1.5	1.65	1.35	1.4	1.9
10	3.35	3.6	2.9	1.9	2.3	3.95	2.15	1.5	1.6	1.35	1.4	2.1
11	3.0	3.35	2.75	1.9	2.35	4.3	2.1	1.5	1.6	1.35	1.4	2.15
12	2.95	3.15	2.65	1.9	3.05	4.1	2.05	1.5	1.6	1.35	1.4	2.2
13	2.85	3.0	2.55	1.9	2.9	3.8	2.2	1.5	1.6	1.3	1.4	2.4
14	2.8	2.85	2.5	1.85	2.95	3.6	2.2	1.5	1.6	1.3	1.4	2.4
15	2.8	2.75	2.45	1.85	2.75	3.45	2.1	1.5	1.6	1.3	1.4	2.5
16	2.8	4.85	2.4	1.85	2.55	3.4	2.0	1.5	1.55	1.3	1.4	2.6
17	2.8	5.8	2.35	1.85	2.4	4.1	1.9	1.5	1.55	1.3	1.4	2.6
18	10.7	5.2	2.3	1.8	2.3	3.95	1.85	1.45	1.55	1.3	1.4	2.6
19	7.9	4.0	2.3	1.8	2.4	12.2	1.8	1.45	1.55	1.3	1.5	2.6
20	5.15	3.45	2.5	1.8	2.4	6.7	1.75	1.45	1.5	1.3	1.5	2.6
21	6.8	3.9	2.4	1.85	2.35	4.3	1.7	1.45	1.5	1.3	1.5	2.6
22	5.35	7.25	2.3	3.1	2.3	3.9	1.65	1.45	1.5	1.3	1.5	2.6
23	4.15	5.6	2.2	3.25	2.25	3.55	1.65	1.45	1.45	1.4	1.5	2.6
24	3.65	4.45	2.15	3.05	2.3	3.3	1.6	1.45	1.45	1.4	1.5	2.7
25	3.35	3.7	2.15	5.55	2.85	3.2	1.6	1.45	1.45	1.4	1.6	2.7
26	3.25	3.6	2.1	4.45	2.9	3.0	1.6	1.45	1.45	1.4	1.6	2.7
27	4.35	3.7	2.1	3.75	2.7	2.8	1.55	1.4	1.4	1.4	1.6	2.7
28	3.9	6.2	2.0	3.6	2.6	2.7	1.5	1.4	1.4	1.4	1.75	2.7
29	3.5	.....	2.0	3.4	2.55	2.5	1.5	1.4	1.4	1.4	1.8	2.9
30	3.3	.....	1.95	3.1	2.5	2.35	1.75	1.4	1.35	1.4	1.8	6.8
31	3.05	.....	1.95	.....	2.5	.....	1.65	1.4	.....	1.4	.....	5.85

NOTE.—Relation of gage height to discharge probably affected by ice about Feb. 8 to 15 and Dec. 6 to 29.

Daily discharge, in second-feet, of Youghiogheny River at Confluence, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	432	935	6,000	244	746	974	432	93	93	40	47	168
2	1,270	858	5,090	244	638	1,800	432	93	127	40	57	168
3	11,200	896	3,690	217	568	1,800	399	80	127	40	57	168
4	6,420	858	2,930	217	499	1,500	366	80	366	33	57	168
5	2,660	638	2,530	244	465	1,750	334	67	366	33	57	168
6	2,930	399	2,350	244	465	2,600	334	67	168	33	47	.....
7	3,550	271	1,800	217	432	1,850	302	67	148	33	47	.....
8	3,060	200	1,410	217	399	1,270	271	67	127	40	47	.....
9	1,800	350	1,140	217	465	1,180	334	67	110	40	47	.....
10	1,270	900	896	217	465	1,850	366	67	93	40	47	.....
11	974	800	783	217	499	2,240	334	67	93	40	47	.....
12	935	700	710	217	1,010	2,020	302	67	93	40	47	.....
13	858	600	638	217	896	1,700	399	67	93	33	47	.....
14	820	500	603	192	935	1,500	399	67	93	33	47	.....
15	820	700	568	192	783	1,360	334	67	93	33	47	.....
16	820	2,930	533	192	638	1,320	271	67	80	33	47	.....
17	820	4,250	499	192	533	2,020	217	67	80	33	47	.....
18	11,100	3,410	465	168	465	1,850	192	57	80	33	47	.....
19	7,190	1,910	465	168	533	13,200	168	57	80	33	67	.....
20	3,340	1,360	603	168	533	5,510	148	57	67	33	67	.....
21	5,650	1,800	533	192	499	2,240	127	57	67	33	67	.....
22	3,620	6,280	465	1,060	465	1,800	110	57	67	33	67	.....
23	2,070	3,970	399	1,180	432	1,450	110	57	57	47	67	.....
24	1,550	2,410	366	1,010	465	1,230	93	57	57	47	67	.....
25	1,270	1,600	366	3,900	858	1,140	93	57	57	47	93	.....
26	1,180	1,500	334	2,410	896	974	93	57	57	47	93	.....
27	2,290	1,600	334	1,650	746	820	80	47	47	47	93	.....
28	1,800	4,810	271	1,500	674	746	67	47	47	47	148	.....
29	1,410	.....	271	1,320	638	603	67	47	47	47	168	700
30	1,230	.....	244	1,060	603	499	148	47	40	47	168	5,650
31	1,010	.....	244	.....	603	.....	110	47	.....	47	.....	4,320

NOTE.—Daily discharge determined by means of a discharge rating curve that is well defined between 750 and 3,800 second-feet (gage heights about 2.7 and 5.5 feet) and fairly well defined throughout the remaining portions of the range of stage covered by the 1910 gage heights. Daily discharge Feb. 8 to 15 and Dec. 6 to 29 estimated, because of ice, from climatologic records and run-off in adjacent drainage areas. Mean discharge Dec. 6 to 28 estimated 150 second-feet.

Monthly discharge of Youghiogheny River at Confluence, Pa., for 1910.

[Drainage area, 435 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	11,200	432	2,750	6.32	7.29	B.
February	6,280	[a] 200	1,690	3.89	4.05	C.
March	6,000	244	1,210	2.78	3.29	B.
April	3,900	168	649	1.49	1.66	B.
May	1,010	399	608	1.40	1.61	B.
June	13,200	499	2,030	4.67	5.21	B.
July	432	67	240	.552	.64	B.
August	93	47	63.4	.146	.17	C.
September	366	40	104	.239	.27	C.
October	47	33	38.9	.089	.10	C.
November	168	47	68.4	.157	.18	C.
December	5,650	.....	483	1.11	1.28	D.
The year	13,200	.....	822	1.89	25.66	

[a] February minimum discharge estimated.

NOTE.—See footnotes to table of daily discharge for periods of estimated discharge.

CASSELMAN RIVER AT CONFLUENCE, PA.

This station, which is located at Confluence, Pa., at a highway bridge about 500 yards from the railroad station, was established by the United States Geological Survey September 15, 1904. It is now maintained by the Water Supply Commission of Pennsylvania, by which the records of gage height and discharge measurements are furnished.

No important tributary enters near the station, but it is located only a few hundred yards above the junction of Casselman and Youghiogheny rivers, and as a result backwater usually occurs at high stages. The relation of gage height to discharge is more or less affected by ice during the winter periods.

No discharge measurements were made at this station during 1910. The station was last inspected June 12, 1909, by F. W. Scheidenhelm. Estimates of daily and monthly discharge for 1910 are withheld for the present.

Daily gage height, in feet, of Casselman River at Confluence, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.30	2.75	6.95	2.05	2.75	2.70	2.20	1.56	1.71	1.36	1.46	1.66
2	3.20	2.75	6.25	2.05	2.65	3.30	2.20	1.56	1.76	1.36	1.46	1.66
3	10.15	2.80	5.25	1.95	2.50	3.15	2.15	1.51	1.76	1.36	1.46	1.66
4	6.05	2.75	4.80	2.00	2.45	3.00	2.15	1.51	2.01	1.31	1.41	1.66
5	3.70	2.45	4.55	2.05	2.40	3.15	2.20	1.46	2.01	1.31	1.41	1.66
6	4.50	2.20	4.45	2.00	2.30	4.05	2.10	1.46	1.86	1.31	1.41	1.86
7	4.60	2.10	4.00	2.00	2.30	3.35	2.05	1.46	1.76	1.31	1.41	1.86
8	3.80	1.95	3.60	1.95	2.20	2.95	2.00	1.46	1.66	1.46	1.41	1.86
9	3.20	2.55	3.40	2.00	2.40	2.90	2.05	1.46	1.61	1.46	1.41	1.86
10	2.75	2.85	3.10	1.95	2.35	3.70	2.10	1.46	1.56	1.41	1.41	.....
11	2.55	2.65	2.90	1.95	2.40	3.85	2.05	1.46	1.56	1.41	1.41	.....
12	2.70	2.55	2.85	1.92	2.95	3.65	2.00	1.46	1.56	1.41	1.41	.....
13	2.45	2.40	2.70	1.92	2.80	3.30	1.95	1.46	1.56	1.41	1.41	.....
14	2.40	2.40	2.70	1.87	2.95	3.10	2.15	1.46	1.56	1.36	1.41	.....
15	2.35	2.35	2.55	1.87	2.70	2.85	2.10	1.56	1.56	1.36	1.41	.....
16	2.35	4.45	2.50	1.87	2.55	2.75	1.96	1.56	1.51	1.36	1.41	.....
17	2.40	5.15	2.50	1.87	2.45	3.35	1.86	1.51	1.51	1.36	1.41	.....
18	9.85	4.40	2.35	1.82	2.30	3.00	1.81	1.51	1.51	1.36	1.41	.....
19	7.00	3.45	2.35	1.82	2.40	12.60	1.76	1.66	1.51	1.36	1.51	.....
20	4.15	3.00	2.55	1.82	2.30	6.35	1.71	1.61	1.46	1.36	1.51	.....
21	6.85	3.35	2.50	1.87	2.30	4.15	1.61	1.61	1.46	1.36	1.51	.....
22	5.10	6.80	2.50	3.10	2.30	3.75	1.56	1.61	1.46	1.36	1.51	.....
23	3.70	4.65	2.45	3.10	2.20	3.15	1.56	1.56	1.41	1.46	1.51	1.86
24	3.30	3.55	2.45	2.90	2.35	2.90	1.56	1.56	1.41	1.46	1.51	1.86
25	3.05	3.15	2.35	6.05	2.05	2.85	1.56	1.56	1.41	1.46	1.66	1.96
26	2.95	3.15	2.35	4.45	2.80	2.75	1.56	1.51	1.41	1.46	1.66	1.96
27	4.00	3.60	2.35	3.70	2.65	2.70	1.56	1.51	1.41	1.46	1.66	2.00
28	3.25	6.35	2.25	3.55	2.55	2.60	1.56	1.46	1.41	1.46	1.66	1.95
29	3.05	.....	2.25	3.45	2.55	2.45	1.51	1.46	1.41	1.46	1.66	2.35
30	2.90	.....	2.15	3.10	2.45	2.25	1.66	1.46	1.36	1.46	1.66	5.55
31	2.85	.....	2.15	.....	2.50	.....	1.56	1.46	.....	1.46	.....	3.45

NOTE.—Relation of gage height to discharge probably affected by ice about Jan. 1 and 2, Feb. 6 to 20, and Dec. 6 to 29.

LAUREL HILL CREEK AT CONFLUENCE, PA.

This station, which is located at Confluence, Pa., at a highway bridge about one-fourth mile from the railroad station, was established by the United States Geological Survey September 15, 1904. It is now maintained by the Water Supply Commission of Pennsylvania, by which the records of gage height and discharge measurements are furnished.

No important tributary enters near the station. It is located, however, only a few hundred yards above the junction of the creek with Youghiogheny River, and as a result backwater almost invariably occurs at high stages. The effect of backwater at medium and low stages is not definitely known as it varies with each flood. At low stages conditions of flow are changeable owing to the fact that refuse dumped into the creek from a tannery a few feet above the station settles under one end of the bridge. As a result the records of flow at this station are not so good as those at the other two Confluence stations. The relation of gage height to discharge is affected by ice during the winter periods.

The datum of the chain gage attached to the bridge has remained constant during the period of maintenance of the station.

No discharge measurements were made at this station during 1910. The station was last inspected June 12, 1909, by F. W. Scheidenhelm. Estimates of daily and monthly discharge for 1910 are withheld for the present.

Daily gage height, in feet, of Laurel Hill Creek at Confluence, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.40	2.50	5.46	2.11	2.51	2.96	2.21	1.56	1.76	1.41	1.51	1.66
2	4.15	2.45	4.86	2.06	2.46	3.56	2.16	1.56	1.76	1.41	1.51	1.66
2	8.00	2.65	4.41	2.01	2.41	3.26	2.11	1.51	1.76	1.41	1.51	1.66
4	4.30	2.55	4.11	1.96	2.36	2.96	2.06	1.51	2.06	1.41	1.46	1.66
5	3.35	2.45	4.11	2.11	2.31	3.21	2.01	1.51	2.06	1.41	1.46	1.66
6	4.30	2.35	4.16	2.06	2.31	3.61	2.01	1.46	1.91	1.41	1.41	1.76
7	4.40	2.30	3.66	2.01	2.26	3.16	1.96	1.46	1.86	1.41	1.41	1.76
8	3.50	2.30	3.41	1.96	2.26	2.91	1.96	1.46	1.81	1.51	1.41	1.76
9	3.15	2.45	3.16	2.01	2.41	2.91	2.06	1.46	1.76	1.51	1.41	1.76
10	2.85	3.00	2.91	2.01	2.51	3.46	2.06	1.46	1.71	1.46	1.41	.....
11	2.65	2.80	2.76	2.01	3.06	3.66	2.01	1.46	1.66	1.46	1.41	.....
12	2.55	2.60	2.71	1.96	3.06	3.26	1.96	1.46	1.66	1.46	1.41	.....
13	2.45	2.50	2.71	1.96	2.96	2.96	1.96	1.46	1.61	1.46	1.41	.....
14	2.40	2.45	2.66	1.91	3.06	2.76	1.96	1.46	1.61	1.46	1.41	.....
15	2.35	2.45	2.61	1.91	2.86	2.61	1.91	1.51	1.61	1.41	1.41	.....
16	2.35	3.80	2.56	1.91	2.71	2.46	1.91	1.51	1.56	1.41	1.41	.....
17	2.30	3.80	2.46	1.91	2.56	2.66	2.31	1.46	1.56	1.41	1.41	.....
18	8.05	3.40	2.36	1.86	2.46	2.46	2.16	1.46	1.56	1.41	1.41	.....
19	5.21	3.15	2.31	1.86	2.56	9.81	2.06	1.61	1.56	1.41	1.56	.....
20	3.55	2.90	2.61	1.86	2.56	3.96	1.96	1.56	1.51	1.41	1.56	.....
21	4.70	3.20	2.51	1.96	2.51	3.16	1.91	1.56	1.51	1.41	1.56	.....
22	3.85	4.55	2.46	2.66	2.46	2.86	1.86	1.56	1.51	1.41	1.56	.....
23	3.35	3.45	2.41	2.96	2.46	2.66	1.86	1.56	1.51	1.51	1.56	1.86
24	3.00	3.16	2.41	2.86	2.46	2.51	1.81	1.51	1.51	1.51	1.56	1.86
25	2.85	2.91	2.36	4.06	2.46	2.36	1.76	1.51	1.46	1.51	1.66	1.86
26	2.75	2.86	2.36	3.51	2.41	2.36	1.66	1.51	1.46	1.51	1.66	1.86
27	3.05	3.06	2.41	3.11	2.31	2.31	1.61	1.51	1.46	1.51	1.66	1.86
28	2.80	4.56	2.36	2.96	2.31	2.51	1.56	1.46	1.46	1.51	1.66	1.86
29	2.70	.....	2.26	2.76	2.31	2.36	1.56	1.46	1.46	1.51	1.66	1.96
30	2.60	.....	2.21	2.66	2.31	2.26	1.66	1.46	1.41	1.51	1.66	4.36
31	2.50	.....	2.16	.....	2.56	.....	1.56	1.46	.....	1.51	.....	3.36

NOTE.—Relation of gage height to discharge probably affected by ice about Jan. 1 and 2, Feb. 6 to 20, and Dec. 6 to 29. River reported "frozen" Dec. 10 to 22.

MUSKINGUM RIVER BASIN.

GENERAL FEATURES.

The drainage basin of Muskingum River lies in the eastern part of the State of Ohio.

The river is formed by the junction of Mohican and Tuscarawas rivers at Coshocton, near the central part of Coshocton County, from which it flows in a slightly southwesterly direction to Zanesville, thence southeastward to its junction with Ohio River at Marietta Ohio. In the southeastern part of Morgan County the river forms a large bend and flows due north for several miles. The length of the river below the junction of the Mohican and Tuscarawas is about 100 miles (map measurement), and its drainage area comprises about 8,000 square miles.

Tuscarawas River rises in the northwestern part of Ashland County, flows in a general southerly direction to the northeastern part of Tuscarawas County and thence southwestward to its junction with

the Mohican. The important tributaries of the Mohican are Walhonding and Killbuck creeks; of the Tuscarawas, Chippewa and Sugar creeks on the west bank and Sandy and Big Stillwater creeks on the east bank.

Muskingum River has only two important tributaries—Licking River from the west near Zanesville and Wills Creek from the east near the southern line of Coshocton County.

The drainage basin is regular in shape, being about 100 miles wide and 125 miles long. Only the headwaters of Licking, Mohican, and Tuscarawas rivers lie within the glaciated area, the remainder of the basin being unglaciated. In the central and southern part of the basin the soil has resulted from the disintegration of native rocks and the country is poorly watered. Its surface is extremely rough and irregular, cut in every direction by valleys between which rise high hills. To the north the surface becomes less broken though it is still undulating; the soil has been derived from drift materials and is sandy and gravelly. At the headwaters of Mohican and Tuscarawas rivers it is naturally marshy. This characteristic has been much modified by cultivation and drainage, but swampy areas still exist. Springs are common in the glaciated region.

The elevation of the sources of Mohican and Tuscarawas rivers is about 1,100 feet; the elevation at Coshocton is about 730 feet; at Zanesville about 688 feet; at the mouth of the river at Marietta the elevation is 570 feet.

There are no large forested areas in this drainage basin. This region has been long settled, and the timber left standing is in groves or wood lots, generally of small size.

The mean annual rainfall is about 40 inches, being less at the headwaters and greater at the mouth of the river. The winters in the northern part are comparatively severe. Ice forms about 1 foot thick on the streams. In the lower part of the basin the winters are milder, but ice generally forms on the river.

The basin affords sites for storage reservoirs at the headwaters of the tributaries, and reservoirs constructed in 1830 to store water for feeding the Ohio Canal are in existence at the present time. The cost of overflowed land would undoubtedly now prohibit reservoir construction.

Both the main stream and tributaries present favorable sites for the development of water power.

The Muskingum is navigable from Zanesville down. In this stretch of the river there are 10 locks and dams with a total fall of 118 feet. The surplus water is available for water power, but only at one or two places is all the power at these dams utilized.

The Ohio Canal, which runs from Cleveland to Portsmouth, Ohio, crosses this drainage basin. At the headwaters of Tuscarawas and Licking rivers are the reservoirs for feeding the canal both ways

from the summits; thus some water is diverted from the Muskingum basin. The surplus water from the canal between the two summits is discharged into Muskingum River near Dresden. About the only use made of the canal at the present time is to furnish water for the power plants situated along its banks.

MUSKINGUM RIVER AT ZANESVILLE, OHIO.

This station is located at the Sixth Street Bridge at Zanesville, about 1,000 feet above Lock No. 10. The gage, which belongs to the United States Engineer Corps, is located at the lock. The United States Weather Bureau furnishes the daily gage heights. The gage was established June 4, 1887. On March 11, 1905, discharge measurements were begun to obtain data for the study of water power, water supply, pollution, and navigation problems.

Licking River enters from the west about half a mile above the station. The drainage area above the section is about 5,830 square miles.

The winters are comparatively severe and ice generally causes some trouble. The operation of several power plants located above the station may modify the low-season flow to some extent.

The datum of the gage has remained unchanged.

The station has not been visited since June, 1906, and nothing is known about the present conditions. Estimates of flow are being withheld at present for further studies.

Daily gage height, in feet, of Muskingum River at Zanesville, Ohio, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.0	11.3	31.6	8.8	9.9	9.0	8.3	8.0	7.7	8.0	7.8	8.0
2	8.3	11.0	31.4	8.7	9.4	9.0	8.2	7.9	7.7	7.9	7.8	8.1
3	9.2	10.7	32.5	8.7	9.4	9.2	8.1	7.8	7.7	7.9	7.8	8.1
4	9.8	12.1	30.3	8.7	10.2	9.5	8.0	7.8	7.7	7.9	7.7	8.0
5	9.7	12.5	27.0	8.6	11.5	9.7	8.0	7.8	7.8	7.8	7.7	8.0
6	10.8	12.1	23.5	8.9	11.3	9.5	8.0	7.8	7.8	7.9	7.7	8.0
7	10.3	10.8	21.2	9.5	10.9	9.2	8.3	7.8	7.8	9.5	7.7	7.9
8	10.2	10.2	18.5	9.4	10.4	9.0	8.0	7.7	7.8	11.8	7.7	7.9
9	10.2	10.2	16.1	9.0	10.0	8.9	8.0	7.7	7.7	10.8	7.7	7.7
10	10.1	10.0	14.2	8.9	9.7	8.9	8.6	7.7	7.9	10.1	7.6	7.7
11	9.8	9.5	13.0	8.7	9.4	10.0	8.3	7.8	7.8	9.8	7.6	7.7
12	9.5	9.4	12.0	8.6	9.7	13.3	8.1	7.7	7.8	9.4	7.6	7.7
13	9.2	10.5	11.4	8.5	9.8	13.4	8.2	7.7	7.8	9.0	7.6	7.7
14	15.9	10.1	10.9	8.4	9.9	11.9	8.2	7.7	7.8	8.5	7.6	7.6
15	19.9	10.0	10.6	8.4	9.4	10.8	8.7	7.7	7.8	8.4	7.8	7.6
16	19.1	10.2	10.2	8.4	9.0	10.0	8.6	7.7	7.8	8.3	7.8	7.6
17	18.4	17.7	10.0	8.4	8.9	9.5	8.3	7.5	7.7	8.2	7.8	7.6
18	17.3	14.7	9.9	8.7	8.4	9.2	8.2	7.6	7.7	8.2	7.7	7.6
19	28.8	14.0	9.8	9.0	9.2	9.0	8.7	7.7	7.7	8.1	7.7	7.6
20	25.8	13.2	9.6	9.3	9.2	8.9	8.4	7.7	7.7	8.1	7.7	7.6
21	24.2	13.1	9.5	10.2	9.4	8.7	8.2	7.8	7.7	8.0	7.7	7.6
22	25.3	13.8	9.7	11.3	10.3	8.6	8.1	7.8	7.6	8.1	7.7	7.6
23	22.8	14.0	9.6	11.3	10.2	8.5	8.0	7.8	7.7	8.2	7.7	7.6
24	19.5	13.3	9.5	10.8	10.3	8.4	7.9	7.7	7.6	8.2	7.7	7.6
25	17.0	12.7	9.4	10.3	10.5	8.3	7.9	7.7	7.7	8.2	7.7	7.6
26	15.3	12.0	9.3	9.9	10.7	8.2	7.8	7.7	7.7	8.2	7.7	8.0
27	14.7	13.7	9.1	10.0	10.6	8.2	7.8	7.7	8.1	8.1	7.7	8.0
28	15.5	27.2	9.0	10.5	10.0	8.2	7.9	7.7	8.4	8.0	7.7	8.1
29	15.2	.....	8.9	10.5	9.5	8.2	7.8	7.7	8.2	7.9	8.0	11.0
30	14.5	.....	8.9	10.0	9.2	8.2	7.8	7.7	8.1	7.9	8.0	13.3
31	13.0	.....	8.8	.....	9.0	.....	8.0	7.7	.....	7.9	.....	14.4

MOHICAN RIVER AT POMERENE, OHIO.

This station which is located at the highway bridge just above the Pennsylvania Railroad bridge at Pomerene, Ohio, about 4 miles from Walhonding, was established December 1, 1910, in cooperation with the Ohio State Experiment Station.

Owl Creek enters 5 miles above the station. A feeder for the Ohio Canal formerly took water from Mohican River near Cavallo, some distance above Pomerene. This feeder has not been used for some time.

Discharge measurements are made from the upstream side of the highway bridge. A standard chain gage is attached to the bridge. The relation of gage height to discharge may be affected by ice during January, February, and December. Sufficient data have not been obtained to permit estimates of flow to be made.

The following discharge measurement was made by C. T. Bailey:

December 1, 1910: Width, 335 feet; area, 1,210 square feet; gage height, 3.76 feet; discharge, 697 second-feet.

Daily gage height, in feet, of Mohican River at Pomerene, Ohio, for 1910.

[F. L. Rodehaver, observer.]

Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.
1	3.77	7	3.34	12	3.32	17	3.24	22	3.20	27	3.30
2	3.55	8	3.34	13	3.32	18	3.24	23	3.20	28	4.00
3	3.48	9	3.33	14	3.32	*19	3.24	24	3.31	29	7.10
4	3.42	10	3.33	15	3.25	20	3.24	25	3.30	30	6.90
5	3.37	11	3.32	16	3.24	21	3.24	26	3.30	31	6.25
6	3.36										

NOTE.—Relation of gage height to discharge affected by ice during December.

KANAWHA RIVER BASIN.

GENERAL FEATURES.

The drainage basin of the Kanawha comprises about one-third of the State of West Virginia, part of western Virginia, and the counties of Alleghany, Ashe, and part of Watauga County in the extreme northwestern part of North Carolina. The lower part of the river, below the mouth of the Gauley, is called the Kanawha; above this point it is called the New.

New River is formed by the union of the North Fork and South Fork a few miles south of the northern boundary of North Carolina. Considering the South Fork as the main stream, as it is the larger, the river rises in the central part of Watauga County near Boone, N. C., whence it flows northeastward across the State line into Virginia. At Radford, Va., the river turns abruptly and flows northwestward across West Virginia, and empties into Ohio River at Point Pleasant, W. Va. The total length of the river is 427 miles. The lower 90 miles have been made navigable by means of locks and dams.

The total drainage area as determined and adjusted from topographic maps comprises 12,197 square miles.

Beginning at the headwaters and following down the right or eastern bank the important tributaries are Big Reed Island Creek and Little River in Virginia; Greenbrier River, Gauley River, Elk River, and Pocotaligo River in West Virginia; those on the left or western bank are Cripple Creek, Reed Creek, Walker Creek, and Wolf Creek in Virginia; East River, Bluestone River, and Coal River in West Virginia.

The drainage area is irregular in outline. Its length, following the general course of the river, is about 240 miles; its width at the widest point is about 140 miles. The sources of the New lie in the Appalachian Mountains among the high ridges that separate this basin from the basins of Peedee and Santee rivers, which drain into the Atlantic Ocean, and from the basin of Tennessee River, which drains into the Ohio. The basins of the tributaries in North Carolina and in the southern part of Virginia are more or less regular in outline and circular in shape. The main river crosses the Allegheny Front just below Pearisburg, Va., near the Virginia and West Virginia line. Along this section the basins of the tributaries are long and narrow. Below the State line to the mouth of the river the valley of the Kanawha proper is very narrow.

As all the tributaries except those in the lower part of the basin drain the steep slopes and precipitous sides of mountainous country, the beds of the streams are rough and rocky and there are many falls and rapids. Along the section traversed by the Chesapeake & Ohio Railway, from the West Virginia line to Charleston, W. Va., and especially from Hinton to the mouth of Gauley River, the scenery is exceptionally fine, for through this section the river is confined to a narrow canyon with mountains on both sides.

The sources of the river are about 3,660 feet above sea level; at its mouth the elevation is 510 feet. The total fall is therefore about 3,100 feet, or an average fall of over 7 feet to the mile. The following table gives some idea of the slope of the river:

Slope of Kanawha River.

Locality.	Elevation.	Distance.	Fall between points.	Distance between points.	Average fall per mile.
	Feet.	*Miles.*	*Feet.*	*Miles.*	*Feet.*
Sources	3,600	0	.....	.....	.....
Junction of North and South Forks	2,500	86	1,100	86	12.8
Radford, Va.	1,760	192	740	106	7.0
Virginia-West Virginia State line	1,500	246	260	54	4.8
Hinton, W. Va.	1,340	270	160	24	6.7
Gauley River	650	331	690	61	11.3
Upper Pool, Lock No. 2	600	343	50	12	4.2
Mouth	510	427	90	84	1.1

Probably from 10 to 20 per cent of the drainage area is forested. Lumbering is being carried on extensively along many of the tributaries especially at the headwaters of the Gauley and Greenbrier, where there are large areas of virgin timber. The mean annual rainfall at the sources of the river in North Carolina is about 55 inches; on that part of the drainage basin in Virginia the rainfall is from 45 to 50 inches; in West Virginia the rainfall is 45 inches.

In general, the winters throughout the basin are mild. Ice does not form very thick, and the snowfall is light and does not last long. During the winter of 1908 and 1909 ice formed about 2 inches thick at a few of the stations in the basin and lasted only a few days.

The basin affords many opportunities for storage reservoirs, there being suitable foundation sites for large dams and readily accessible material for their construction. Reservoirs would be of use for flood control, as an aid to navigation, and for waterpower development. At the present time the basin affords abundant supplies of coal, oil, and gas, but as these supplies diminish and the cost of fuel increases the numerous opportunities for power development afforded by the river and its tributaries will be very extensively utilized. The lower part of the river has been made navigable by means of 10 locks and dams, the lift ranging from about 6 feet to 14 feet. The lock farthest upstream is located at Montgomery, W. Va., about 84 miles above the mouth; the lowest lock is near Point Pleasant, about 1 mile above the mouth of the river. The river is used principally for transporting the coal mined from the extensive coal fields along the river above Charleston.

At ordinary stages the water of the tributaries is clear, and some of the larger streams afford excellent trout and bass fishing. The water of the main stream is rarely, if ever, clear, being of a reddish-brown color due to the hydraulic mining of iron ore carried on in Virginia.

SOUTH FORK OF NEW RIVER NEAR CRUMPLER, N. C.

This station, which is located about 1½ miles above the confluence of the North and South forks of New River, about 4 miles from Crumpler, N. C., was established August 12, 1908.

The drainage area above the section is about 325 square miles.

Discharge measurements are made by means of a boat or by wading.

The chain gage is attached to a tree on the left bank about one-half mile above the measuring section. The datum of the gage has remained unchanged; the records are reliable and accurate. The relation of gage height to discharge may be affected by ice for short periods in winter.

Sufficient data have not been obtained to enable estimates of the flow to be made.

The following discharge measurement was made by C. T. Bailey:

November 1, 1910: Width, 173 feet; area, 393 feet square; gage height, 1.33 feet; discharge, 420 second-feet.

Daily gage height, in feet, of South Fork of New River near Crumpler, N. C., for 1910.

[J. J. Garvey, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.10	1.53	2.12	1.28	1.28	1.18	1.43	1.30	3.38	1.40	1.33	1.22
2	2.09	1.37	2.14	1.30	1.24	1.17	1.42	1.32	2.32	1.35	1.33	1.45
3	1.80	1.50	1.91	1.33	1.22	1.15	1.38	1.30	1.86	1.30	1.34	1.34
4	1.67	1.44	1.75	1.30	1.30	1.14	1.60	1.46	1.76	1.30	1.30	1.42
5	1.58	1.56	1.68	1.76	1.18	1.28	1.92	1.32	1.76	1.32	1.30	1.44
6	1.44	1.52	1.68	1.22	1.15	1.46	1.75	1.26	1.77	1.68	1.30	2.07
7	2.20	1.28	1.64	1.21	1.23	1.38	1.78	1.28	1.59	2.82	1.30	1.98
8	1.97	1.41	1.54	1.21	1.66	1.22	1.69	1.30	1.50	2.82	1.28	1.64
9	1.76	1.38	1.50	1.20	1.80	1.26	1.64	1.30	1.49	2.52	1.26	1.54
10	1.74	1.32	1.50	1.20	1.57	1.55	1.60	1.32	1.44	2.04	1.25	1.56
11	1.52	1.46	1.52	1.20	1.43	1.40	1.56	1.22	1.41	1.79	1.24	1.34
12	1.53	1.26	1.51	1.26	1.34	2.96	2.12	1.15	1.48	1.68	1.24	1.52
13	1.48	1.42	1.46	1.48	1.40	2.56	1.78	1.20	1.42	1.62	1.24	1.30
14	1.46	1.66	1.48	1.38	1.36	2.52	1.64	1.20	1.39	1.54	1.30	1.16
15	1.39	1.74	1.42	1.33	1.30	2.74	1.54	1.22	1.38	1.50	1.28	1.36
16	1.42	1.65	1.39	1.44	1.30	2.18	1.46	1.22	1.35	1.48	1.28	1.32
17	1.32	1.95	1.40	1.48	1.30	1.92	1.96	1.20	1.30	1.44	1.20	1.27
18	1.40	2.96	1.38	1.48	1.34	1.79	1.78	1.17	1.28	1.42	1.23	1.38
19	1.38	2.06	1.38	1.42	1.32	1.68	1.56	1.20	1.26	1.43	1.20	1.43
20	1.35	1.88	1.38	1.36	1.31	1.57	1.44	1.20	1.25	1.74	1.20	1.34
21	1.88	1.79	1.43	1.34	1.33	1.60	1.41	1.24	1.26	1.70	1.19	1.23
22	1.94	1.76	1.39	1.32	1.56	1.63	1.38	1.34	1.22	1.50	1.20	1.16
23	1.66	1.70	1.34	1.28	1.34	1.52	1.36	1.30	1.20	1.45	1.20	1.42
24	1.48	1.64	1.32	1.33	1.42	1.62	1.32	1.28	1.20	1.35	1.20	1.70
25	1.52	1.58	1.31	1.36	1.60	1.73	1.33	1.22	1.30	1.32	1.28	1.54
26	1.40	1.48	1.31	1.47	1.61	1.69	1.32	1.26	1.64	1.34	1.24	1.51
27	1.46	1.46	1.32	1.44	1.44	1.54	1.30	1.30	1.50	1.33	1.23	1.38
28	1.42	1.94	1.31	1.38	1.33	1.50	1.38	1.23	1.64	1.38	1.30	1.38
29	1.36	.....	1.30	1.34	1.30	1.56	1.46	1.18	1.42	1.40	1.28	1.44
30	1.36	.....	1.31	1.31	1.22	1.54	1.39	1.30	1.44	1.34	1.24	1.63
31	1.38	.....	1.28	.....	1.20	.....	1.32	2.10	.....	1.33	.....	1.60

NOTE.—Relation of gage height to discharge probably affected by ice about Jan. 1 to 11 and during December.

NEW RIVER NEAR GRAYSON, VA.

This station, which is located at the Norfolk & Western Railway bridge at Fries Junction, about 1 mile from Grayson, Va., was established August 7, 1908.

Chestnut Creek enters immediately below the section. The drainage area above the station is about 1,160 square miles.

The datum of the chain gage attached to the railroad bridge has remained unchanged.

About 4 miles above the gaging section is a large cotton mill which is run by water power. The flow of the river during periods of low water is affected by the operation of this power plant. The relation of gage height is affected little if at all by ice.

The records are reliable and accurate. Sufficient data have not yet been obtained to enable estimates of the flow to be made.

Discharge measurements of New River near Grayson, Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 17	C. T. Bailey	629	1,180	3.96	1,480
Oct. 22	do	632	1,180	4.00	1,470

NOTE.—See table of miscellaneous discharge measurements on page 149 for results of discharge measurement made about 1 mile below this station.

Daily gage height, in feet, of New River near Grayson, Va., for 1910.

[Oscar Williams, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.98	3.80	4.92	3.80	3.90	3.80	4.10	3.85	5.79	3.88	3.81	3.72
2	4.08	3.82	5.05	3.79	3.86	3.77	4.00	3.80	5.16	3.81	3.80	3.70
3	4.54	3.99	4.85	3.84	3.85	3.78	4.02	3.96	4.87	3.77	3.82	3.69
4	4.46	4.16	4.60	3.88	3.84	3.73	3.62	3.92	4.63	3.75	3.80	3.72
5	4.20	4.02	4.46	3.84	3.84	3.82	4.30	4.08	4.50	3.72	3.78	3.86
6	4.08	3.88	4.40	3.79	3.81	4.11	4.62	3.95	4.29	3.82	3.78	4.20
7	4.55	3.89	4.40	3.79	3.76	4.14	4.52	3.85	4.12	4.44	3.76	4.50
8	4.85	3.86	4.22	3.73	4.00	3.88	4.54	3.93	4.05	5.32	3.75	4.48
9	4.40	3.99	4.17	3.72	4.40	3.86	4.98	3.92	4.01	5.31	3.75	4.26
10	4.10	3.96	4.14	3.66	4.34	3.96	4.42	3.83	3.99	4.65	3.74	4.12
11	3.99	4.04	4.13	3.68	4.12	4.82	4.26	3.78	3.99	4.27	3.74	4.00
12	3.92	3.80	4.14	3.70	4.08	6.08	4.40	3.76	3.92	4.11	3.70	3.90
13	4.10	3.80	4.11	4.01	4.08	6.50	4.75	3.80	3.92	4.01	3.70	3.73
14	4.10	3.91	4.01	4.05	4.04	6.09	4.50	3.87	3.89	3.97	3.72	3.63
15	4.04	4.02	3.98	3.93	3.94	5.93	4.22	3.80	3.87	3.93	3.76	3.65
16	3.98	4.34	3.92	3.88	3.90	5.46	4.15	3.75	3.82	3.89	3.78	3.79
17	3.92	4.80	3.91	3.98	3.88	5.04	4.36	3.87	3.79	3.87	3.78	3.70
18	3.98	6.06	3.90	4.11	3.90	4.70	4.40	3.70	3.75	3.85	3.71	3.81
19	3.95	5.33	3.89	4.08	3.95	4.52	4.26	3.72	3.73	3.86	3.72	3.92
20	3.98	4.67	3.90	3.96	3.92	4.42	4.14	3.76	3.72	3.97	3.71	3.89
21	4.10	4.58	3.98	3.93	3.90	4.62	4.01	3.78	3.73	4.12	3.70	3.72
22	4.82	4.54	3.92	3.90	3.90	4.68	3.98	3.88	3.75	4.02	3.70	3.35
23	4.36	4.45	3.91	3.89	4.14	4.54	3.94	3.88	3.70	3.88	3.68	3.80
24	4.25	4.32	3.85	3.88	4.14	4.22	3.90	3.80	3.69	3.85	3.69	4.00
25	4.18	4.26	3.86	3.98	4.28	4.61	3.86	3.76	3.71	3.81	3.72	4.22
26	4.06	4.18	3.85	4.04	4.45	4.46	3.86	3.75	3.75	3.80	3.72	4.08
27	3.97	4.12	3.84	4.12	4.20	4.32	3.84	3.76	3.87	3.80	3.71	4.06
28	4.00	4.30	3.86	4.11	4.06	4.20	3.84	3.74	3.99	3.86	3.75	4.04
29	3.99	.....	3.81	4.06	3.96	4.12	3.90	3.74	3.97	3.84	3.77	4.13
30	4.00	.....	3.81	3.94	3.90	4.12	3.96	3.75	3.93	3.83	3.92	4.25
31	3.97	.....	3.79	.....	3.85	.....	3.88	4.23	.....	3.82	.....	4.36

NOTE.—Relation of gage height to discharge probably affected by ice about Jan. 1 to 4, and during December.

NEW RIVER AT RADFORD, VA.

This station, which is located at the toll highway bridge about 1½ miles below the Norfolk & Western Railway bridge near the Norfolk & Western Railway station at Radford, Va., was established August 1, 1898, discontinued July 15, 1906, and reestablished May 6, 1907.

No important tributaries enter in the immediate vicinity of this station. Little River enters from the right about 6 miles above the station.

The United States Weather Bureau gage was originally used at this point, but owing to its inaccessibility it was replaced by a wire gage referred to the same datum February 23, 1900. On December 1,

1903, the wire gage was replaced by a chain gage and the datum lowered 3.41 feet to avoid negative readings. Many errors entered into the gage readings prior to the installation of the chain gage, and estimates of discharge based on them are not very reliable. All estimates at this station were revised in 1905, but it was impossible to eliminate all the gage errors.

Conditions of flow are constant, and the discharge is only occasionally affected by backwater from ice. A good low-water rating curve has been developed from recent measurements and two recomputed measurements made in 1900 and 1901. At high stages the rating curve is only approximate. The tubular piers of the bridge interfere somewhat with the discharge measurements, and errors have occurred in some measurements due to not considering the area and velocity immediately above them.

Revised data for this station prior to 1906 have been published in Bulletin 3 of the Geological Survey of Virginia.

Discharge measurements of New River at Radford, Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 15	C. T. Bailey	540	1,780	3.85	2,730
Oct. 20	do	539	1,660	3.62	2,120

Daily gage height, in feet, of New River at Radford, Va., for 1910.

[Wm. T. Linkous, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.4	3.8	4.1	3.6	3.8	3.4	4.0	3.4	5.2	3.5	3.45	3.4
2	3.4	3.9	4.1	3.7	3.7	3.4	4.0	3.35	5.25	3.5	3.5	3.25
3	3.9	3.7	4.9	3.6	3.7	3.5	3.9	3.4	4.25	3.4	3.5	3.15
4	4.8	3.7	5.8	3.95	3.65	3.4	4.15	3.5	4.3	3.4	3.4	3.2
5	4.1	3.8	5.2	3.85	3.6	3.45	4.15	3.7	4.3	3.55	3.4	3.4
6	4.2	3.8	4.5	3.8	3.55	3.6	3.95	3.6	4.2	3.4	3.5	3.6
7	4.2	3.6	4.5	3.6	3.5	4.0	4.35	3.7	4.1	3.55	3.4	4.6
8	4.4	3.8	4.4	3.5	3.55	3.8	4.55	3.6	4.1	4.9	3.45	4.3
9	4.4	3.8	4.3	3.5	3.75	3.8	4.5	3.6	3.8	6.05	3.4	3.8
10	3.6	3.9	4.2	3.4	4.25	3.95	4.6	3.5	3.75	5.0	3.4	3.75
11	3.4	3.9	4.1	3.45	3.95	5.05	4.25	3.6	3.65	4.2	3.4	3.65
12	3.7	3.9	4.1	3.45	3.9	7.9	4.0	3.45	3.5	3.9	3.4	3.35
13	3.8	3.1	3.8	4.05	3.8	9.1	4.55	3.4	3.5	2.9	3.3	3.3
14	3.9	3.2	3.8	4.2	3.75	9.7	4.85	3.4	3.5	2.95	3.35	3.15
15	3.9	3.5	3.7	4.05	3.7	7.05	4.5	3.5	3.55	3.0	3.3	2.95
16	3.7	4.7	3.8	3.85	3.6	6.55	4.05	3.4	3.55	2.9	3.35	3.3
17	3.6	4.8	3.75	3.9	3.7	5.85	4.3	3.5	3.3	2.9	3.45	3.45
18	3.6	8.4	3.8	4.7	3.7	5.1	4.95	3.4	3.3	3.4	3.5	3.45
19	3.7	7.2	3.75	4.15	3.8	4.95	4.55	3.5	3.3	3.5	3.4	3.5
20	3.8	5.1	3.75	3.95	3.8	4.75	4.0	3.4	3.4	3.6	3.4	3.5
21	4.1	5.4	3.8	3.85	3.6	4.5	4.0	3.5	3.4	3.5	3.4	3.35
22	4.2	4.8	3.8	3.85	3.7	4.55	3.75	3.5	3.25	3.65	3.35	3.3
23	4.6	4.6	3.8	3.75	3.9	4.55	3.75	3.6	3.3	3.6	3.4	3.2
24	4.4	4.5	3.75	3.7	4.2	4.45	3.7	3.5	3.2	3.5	3.25	3.2
25	4.2	4.3	3.7	3.75	4.3	5.05	3.6	3.55	3.2	3.45	3.2	3.3
26	4.1	4.1	3.7	3.9	4.5	4.75	3.55	3.5	3.3	3.4	3.3	3.5
27	3.9	4.1	3.7	4.2	4.45	4.1	3.5	3.7	3.5	3.45	3.3	3.7
28	3.8	4.1	3.6	4.0	4.15	4.1	3.5	3.6	3.5	3.5	3.45	3.7
29	3.4	.....	3.6	3.95	3.8	4.05	3.4	3.6	3.6	3.4	3.5	3.8
30	3.8	.....	3.6	3.8	3.75	3.85	3.4	3.5	3.55	3.4	3.45	3.85
31	3.9	.....	3.55	.....	3.5	.....	3.2	3.3	.....	3.4	.....	4.0

NOTE.—Ice reported along banks Jan. 1; relation of gage height to discharge probably not affected by ice.

Daily discharge, in second-feet, of New River at Radford, Va., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,580	2,630	3,560	2,080	2,630	1,580	3,240	1,580	7,560	1,820	1,700	1,580
2	1,580	2,930	3,560	2,350	2,350	1,580	3,240	1,470	7,760	1,820	1,820	1,260
3	2,930	2,350	6,400	2,080	2,350	1,820	2,930	1,580	4,060	1,580	1,820	1,060
4	6,020	2,350	9,970	3,080	2,220	1,580	3,720	1,820	4,230	1,580	1,580	1,150
5	3,560	2,630	7,560	2,780	2,080	1,700	3,720	2,350	4,230	1,950	1,580	1,580
6	3,890	2,630	4,930	2,630	1,950	2,080	3,080	2,080	3,890	1,580	1,820	2,080
7	3,890	2,080	4,930	2,080	1,820	3,240	4,400	2,350	3,560	1,950	1,580	5,290
8	4,580	2,630	4,580	1,820	1,950	2,630	5,110	2,080	3,560	6,400	1,700	4,230
9	4,580	2,630	4,230	1,820	2,490	2,630	4,930	2,080	2,630	11,000	1,580	2,780
10	2,080	2,930	3,890	1,580	4,060	3,080	5,290	1,820	2,490	6,780	1,580	2,350
11	1,580	2,930	3,560	1,700	3,080	6,980	4,060	2,080	2,220	3,890	1,580	2,220
12	2,350	2,930	3,560	1,700	2,930	19,200	3,240	1,700	1,820	2,930	1,580	1,470
13	2,630	960	2,630	3,400	2,630	24,900	5,110	1,580	1,820	620	1,360	1,360
14	2,930	1,150	2,630	3,890	2,490	27,800	6,210	1,580	1,820	700	1,470	1,060
15	2,930	1,820	2,350	3,400	2,350	15,300	4,930	1,820	1,950	780	1,360	700
16	2,350	5,650	2,630	2,780	2,080	13,100	3,400	1,580	1,950	620	1,470	1,360
17	2,080	6,020	2,490	2,930	2,350	10,200	4,230	1,820	1,360	620	1,700	1,700
18	2,080	21,500	2,630	5,650	2,350	7,170	6,590	1,580	1,360	1,580	1,820	1,700
19	2,350	16,000	2,490	3,720	2,630	6,590	5,110	1,820	1,360	1,820	1,580	1,820
20	2,630	7,170	2,490	3,080	2,630	5,840	3,240	1,580	1,580	2,080	1,580	1,820
21	3,560	8,350	2,630	2,780	2,080	4,930	3,240	1,820	1,580	1,820	1,580	1,470
22	3,890	6,020	2,630	2,780	2,350	5,110	2,490	1,820	1,260	2,220	1,470	1,360
23	5,290	5,290	2,630	2,490	2,930	5,110	2,490	2,080	1,360	2,080	1,580	1,150
24	4,580	4,930	2,490	2,350	3,890	4,760	2,350	1,820	1,150	1,820	1,260	1,150
25	3,890	4,230	2,350	2,490	4,230	6,980	2,080	1,950	1,150	1,700	1,150	1,360
26	3,560	3,560	2,350	2,930	4,930	5,840	1,950	1,820	1,360	1,580	1,360	1,820
27	2,930	3,560	2,350	3,890	4,760	3,560	1,820	2,350	1,820	1,700	1,360	2,350
28	2,630	3,560	2,080	3,240	3,720	3,560	1,820	2,080	1,820	1,820	1,700	2,350
29	1,580	.....	2,080	3,080	2,630	3,400	1,580	2,080	2,080	1,580	1,820	2,630
30	2,630	.....	2,080	2,630	2,490	2,780	1,580	1,820	1,950	1,580	1,700	2,780
31	2,930	.....	1,950	.....	1,820	.....	1,150	1,360	.....	1,580	.....	3,240

NOTE.—Daily discharge determined by means of a discharge rating curve that is well defined between 780 and 17,400 second-feet (gage heights 3.0 and 7.5 feet); fairly well defined between 17,800 and 24,400 second-feet (gage heights 7.6 and 9.0 feet), and above 24,400 second-feet (gage height 9.0 feet), is based on comparisons with record of flood discharge at Hinton, Kanawha Falls, and Charleston, W. Va., and is poorly defined.

Monthly discharge of New River at Radford, Va., for 1910.

[Drainage area, 2,720 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	6,020	1,580	3,100	1.14	1.31	A.
February	21,500	960	4,690	1.72	1.79	A.
March	9,970	1,950	3,440	1.26	1.45	A.
April	5,650	1,580	2,770	1.02	1.14	A.
May	4,930	1,820	2,750	1.01	1.16	A.
June	27,800	1,580	6,830	2.51	2.80	A.
July	6,590	1,150	3,490	1.28	1.48	A.
August	2,350	1,360	1,850	.680	.78	A.
September	7,760	1,150	2,560	.941	1.05	A.
October	11,000	620	2,310	.849	.98	A.
November	1,820	1,150	1,570	.577	.64	A.
December	5,290	700	1,940	.713	.82	A.
The year	27,800	620	3,090	1.14	15.40	

NEW RIVER AT FAYETTE, W. VA.

This station, which is located at the highway bridge connecting Fayette with South Fayette, W. Va., was established July 29, 1895; discontinued May 22, 1901; reestablished August 11, 1902; discontinued December 31, 1904; and reestablished July 16, 1908.

Wolf Creek enters on the left bank about 850 feet below the station; the drainage area above the section is about 6,800 square miles.

The bed of the river here is rock, with large bowlders on the bottom which causes eddies and boils at high stages. The bottom has been carefully sounded, and by using standard soundings and care in making measurements the discharge can be determined with accuracy.

The datum of the gage has remained constant during the maintenance of the station, but errors have entered into many of the gage readings prior to 1908, particularly before the chain gage was installed, November 20, 1903, the original wire gage being frequently many tenths in error. Owing to this cause and to the difficulty of making accurate measurements at Fayette, all estimates of discharge heretofore published are only fair.

Estimates of the discharge are withheld for the present.

Discharge measurements of New River at Fayette, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 7	Horton and Bailey	228	3,730	6.88	13,000
7	do	228	3,730	6.90	12,900
28	C. T. Bailey	182	2,820	2.68	4,340
June 18	H. J. Jackson	300	6,360	16.02	46,700
18	do	295	5,900	14.68	40,900
19	do	281	4,940	11.17	26,800
19	do	278	4,800	10.72	25,200
20	do	273	4,480	9.62	21,500
20	do	273	4,320	9.05	19,300
Oct. 12	C. T. Bailey	200	3,060	3.72	5,420

Daily gage height, in feet, of New River at Fayette, W. Va., for 1910.

[A. E. Pierson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.45	3.80	7.95	2.35	5.42	3.60	3.68	2.10	1.45	2.08	1.11	2.38
2	1.68	3.45	12.32	2.25	4.90	3.05	3.39	2.00	2.42	1.68	1.22	2.00
3	3.32	3.42	11.45	2.22	4.35	2.75	3.14	1.92	5.76	1.48	1.19	1.85
4	5.32	4.55	9.70	2.85	3.95	2.48	4.42	1.75	4.90	1.22	1.11	1.28
5	7.05	5.62	8.15	3.77	3.60	2.70	5.66	1.82	4.50	1.08	1.09	1.08
6	5.95	5.42	7.12	4.28	3.34	7.35	5.70	1.94	4.32	.94	1.00	1.86
7	8.38	4.96	6.85	3.65	3.15	8.25	5.78	2.10	4.12	.84	1.04	2.90
8	10.20	3.52	6.78	3.15	3.24	6.95	5.86	2.04	3.50	.96	1.05	3.82
9	9.15	3.60	6.35	2.85	3.69	5.55	5.69	1.80	2.98	2.88	.90	4.00
10	6.95	4.22	5.78	2.58	4.20	4.78	5.99	1.73	2.55	5.85	.76	3.00
11	5.05	4.30	5.48	2.38	4.84	5.70	5.82	1.82	2.20	4.90	.74	2.50
12	4.12	4.10	5.25	2.48	4.98	9.40	4.64	1.54	2.00	3.62	.80	2.18
13	3.55	3.25	5.18	3.58	4.72	14.15	4.18	1.38	1.92	2.72	.76	2.20
14	3.78	3.08	5.38	5.35	4.62	19.00	5.08	1.19	1.94	2.25	.72	1.80
15	3.98	3.28	5.28	6.12	4.82	16.35	6.32	1.15	1.84	1.92	.72	1.30
16	3.55	4.30	4.95	5.39	4.39	14.95	5.68	1.22	1.76	1.64	.62	1.02
17	3.20	7.32	4.70	4.61	3.90	21.95	4.95	1.35	1.55	1.43	.72	.55
18	3.25	11.20	4.08	5.02	3.62	15.94	7.82	1.26	1.36	1.28	.85	.30
19	7.18	15.30	3.82	6.15	3.72	11.16	9.48	1.24	1.19	1.10	.94	1.60
20	7.80	10.92	3.58	6.30	3.82	9.19	7.70	1.12	1.06	1.10	.84	1.78
21	8.28	8.45	3.42	6.42	3.85	8.90	5.75	.92	.92	1.08	.89	1.50
22	13.32	7.50	3.26	7.08	3.80	7.64	4.58	.92	.90	1.38	.78	1.25
23	11.72	7.90	3.18	6.52	3.84	7.44	3.86	1.26	.88	1.78	.62	.70
24	8.55	7.95	3.15	7.16	3.95	7.06	3.40	1.18	.81	1.81	.66	2.00
25	6.90	6.98	2.95	7.10	4.30	7.02	3.19	1.32	.72	1.54	.66	2.00
26	6.02	6.05	2.75	6.85	4.82	6.22	2.94	1.60	.82	1.31	.62	2.62
27	5.48	5.40	2.78	6.40	5.22	6.02	2.52	1.42	.71	1.24	.60	2.68
28	5.48	5.08	2.66	6.60	4.90	5.04	2.32	1.80	1.48	1.18	1.28	3.65
29	5.15	.....	2.55	6.46	4.22	4.42	2.18	1.40	1.98	1.18	1.90	3.58
30	4.48	.....	2.46	6.20	4.00	4.08	2.04	1.35	2.34	1.11	2.25	5.00
31	4.08	.....	2.39	.....	4.10	.....	2.00	1.22	.....	1.16	.....	9.62

NORTH FORK OF NEW RIVER NEAR CRUMPLER, N. C.

This station, which is located at a ford about 1 mile above the confluence of the North and South forks of New River, about 2½ miles north of Crumpler, N. C., was established August 13, 1908.

The drainage area above the section is about 279 square miles.

The chain gage is attached to posts on the right bank about one-fourth mile below the ford. The datum of the gage has remained unchanged.

Discharge measurements are made by means of a boat at the ford or by wading.

The relation of gage height to discharge may be affected, to a small extent, by ice for short periods in winter. The records are accurate and reliable. Sufficient data have not been obtained to enable estimates of the discharge to be made.

The following discharge measurement was made by C. T. Bailey:

November 1, 1910: Width, 201 feet; area, 195 square feet; gage height, 1.64 feet; discharge, 216 second-feet.

Daily gage height, in feet, of North Fork of New River near Crumpler, N. C., for 1910.

[J. J. Garvey, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.53	1.93	3.19	1.66	1.95	1.77	1.91	1.79	2.97	1.73	1.66	2.15
2	2.93	2.00	2.98	1.66	1.90	1.76	1.85	1.95	2.38	1.63	1.70	2.36
3	2.98	2.23	2.78	1.68	1.84	1.72	1.99	1.79	2.81	1.57	1.70	2.32
4	2.48	2.60	2.61	1.70	1.92	1.69	2.09	2.33	2.59	1.57	1.66	2.27
5	2.15	2.12	2.48	1.64	1.88	2.09	2.16	2.22	2.69	1.60	1.60	2.16
6	2.10	2.19	2.49	1.59	1.78	2.48	2.93	1.97	2.28	1.63	1.60	4.10
7	3.82	1.96	2.38	1.58	1.82	1.99	2.74	1.89	2.09	1.99	1.59	2.78
8	2.72	2.30	2.23	1.54	2.70	1.90	3.85	1.97	2.02	2.24	1.56	2.32
9	2.57	2.11	2.13	1.56	2.70	1.87	3.05	1.97	2.03	2.33	1.56	2.22
10	2.26	2.18	2.16	1.51	2.47	2.35	2.65	1.81	2.11	1.91	1.53	2.08
11	2.17	1.96	2.28	1.48	2.30	2.86	2.50	1.76	1.95	1.77	1.53	2.14
12	2.20	1.56	2.16	1.57	2.22	3.63	2.73	1.65	2.14	1.71	1.52	1.82
13	2.04	3.06	2.05	2.18	2.36	3.98	2.53	1.85	1.82	1.63	1.60	1.68
14	2.00	3.32	1.98	1.87	2.12	3.72	2.37	1.82	1.78	1.63	1.53	1.74
15	1.96	2.79	1.93	1.70	2.06	3.63	2.17	1.68	1.77	1.59	1.80	1.82
16	1.69	2.57	1.87	1.94	2.00	3.37	2.07	1.71	1.72	1.58	1.62	1.78
17	2.00	3.22	1.92	1.88	1.98	3.10	2.61	1.63	1.65	1.57	1.52	1.65
18	1.99	4.36	1.86	2.16	2.11	2.78	2.29	1.57	1.59	1.56	1.53	1.91
19	2.54	3.10	1.82	1.94	2.04	2.54	2.12	1.73	1.61	1.59	1.52	1.93
20	2.13	2.80	1.92	1.92	1.96	2.42	2.01	1.84	1.63	2.05	1.52	1.88
21	2.98	2.67	1.87	1.96	2.00	3.20	1.95	2.03	1.70	1.81	1.50	1.31
22	2.75	2.72	1.82	1.96	2.32	3.03	1.93	1.87	1.63	1.68	1.49	1.65
23	2.48	2.56	1.79	1.92	2.19	2.77	1.89	1.79	1.55	1.70	1.48	2.08
24	2.42	2.39	1.78	2.22	2.09	2.98	1.83	1.69	1.59	1.57	1.51	2.67
25	2.20	2.36	1.76	2.13	2.57	2.58	1.81	1.61	1.61	1.57	1.80	2.16
26	2.09	2.31	1.70	2.34	2.34	2.29	1.77	1.59	1.77	1.53	1.78	2.14
27	2.16	2.28	1.69	3.31	2.19	2.16	1.81	1.68	1.69	1.49	1.60	2.08
28	2.13	2.40	1.70	2.22	2.04	2.09	2.26	1.59	1.82	1.81	1.77	2.04
29	2.10	.....	1.70	2.12	1.96	2.07	2.09	1.52	1.70	1.73	2.18	2.26
30	1.95	.....	1.69	2.02	1.88	2.04	1.87	1.64	1.67	1.69	1.88	2.56
31	2.24	.....	1.68	.....	1.83	.....	1.84	3.09	.....	1.68	.....	2.46

NOTE.—Relation of gage height to discharge probably affected by ice about Jan. 1 to 11 and during December.

REED CREEK AT GRAHAMS FORGE, VA.

This station, which is located at the highway bridge at Grahams Forge, Va., was established July 29, 1908.

The drainage area above the station is about 247 square miles.

There is a dam and grist mill just above the station. The storage is small, and the miller states that water flows over the dam at all times, so that the flow is modified little, if any, by the dam.

The datum of the chain gage attached to the bridge has remained unchanged, and the records are reliable and accurate.

Sufficient data have not been obtained to enable estimates of the discharge to be made.

Discharge measurements of Reed Creek at Grahams Forge, Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 18	C. T. Bailey	125	218	2.41	192
Oct. 21	.....do	124	184	2.09	95.1

Daily gage height, in feet, of Reed Creek at Grahams Forge, Va., for 1910.

[Munsey Runion, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.16	2.42	2.62	2.24	2.54	2.23	2.30	2.22	2.08	2.08	2.04	2.08
2	2.15	2.40	2.88	2.24	2.48	2.22	2.34	2.25	2.17	2.07	2.00	2.05
3	2.50	2.42	2.84	2.24	2.42	2.20	2.36	2.26	2.20	2.06	2.02	2.06
4	2.52	2.48	2.78	2.38	2.41	2.21	2.36	2.42	2.14	2.08	2.02	2.07
5	2.40	2.46	2.73	2.34	2.36	2.28	2.38	2.39	2.10	2.06	2.03	2.06
6	2.40	2.58	2.75	2.32	2.34	2.68	2.49	2.31	2.14	2.06	2.04	2.52
7	3.20	2.52	2.91	2.31	2.33	2.56	2.56	2.26	2.14	2.08	2.02	2.48
8	3.00	2.46	2.76	2.20	2.40	2.42	2.51	2.23	2.15	2.19	2.00	2.25
9	2.62	2.44	2.66	2.22	2.44	2.36	2.47	2.28	2.16	2.21	2.00	2.19
10	2.50	2.40	2.60	2.16	2.40	2.40	2.46	2.26	2.22	2.09	2.04	2.10
11	2.53	2.36	2.60	2.31	2.38	3.44	2.38	2.27	2.24	2.09	2.04	2.16
12	2.46	2.31	2.55	2.31	2.34	3.44	2.36	2.21	2.13	2.07	2.04	2.12
13	2.40	2.32	2.46	3.22	2.32	4.80	2.38	2.20	2.14	2.08	2.02	2.08
14	2.36	2.38	2.41	2.90	2.31	4.40	2.35	2.20	2.16	2.08	2.04	2.14
15	2.34	2.48	2.41	2.64	2.32	3.74	2.33	2.14	2.14	2.05	2.06	2.10
16	2.31	2.64	2.35	2.58	2.35	3.32	2.30	2.17	2.10	2.01	2.04	2.12
17	2.28	3.11	2.39	2.65	2.35	3.40	2.42	2.04	2.10	2.02	2.04	2.10
18	2.30	4.25	2.34	2.80	2.35	3.16	2.64	2.08	2.10	2.01	2.06	2.08
19	2.32	3.14	2.33	2.76	2.46	2.84	2.55	2.18	2.04	2.05	2.04	2.05
20	2.45	2.91	2.30	2.64	2.49	2.95	2.47	2.14	2.10	2.11	2.03	2.00
21	2.58	2.86	2.51	2.64	2.51	2.78	2.34	2.09	2.08	2.48	2.00	2.00
22	2.55	2.80	2.48	2.69	2.49	2.69	2.34	2.16	2.10	2.10	2.02	2.06
23	2.88	2.72	2.32	2.67	2.54	2.63	2.26	2.02	2.11	2.10	2.02	2.14
24	2.74	2.60	2.29	2.66	2.47	2.60	2.29	2.09	2.11	2.05	2.03	2.11
25	2.59	2.56	2.31	2.75	2.64	2.58	2.28	2.10	2.07	2.07	2.03	2.17
26	2.51	2.50	2.28	2.84	2.74	2.54	2.31	2.02	2.05	2.04	2.05	2.20
27	2.47	2.50	2.28	2.86	2.54	2.46	2.28	2.10	2.12	2.06	2.04	2.17
28	2.48	2.50	2.28	2.74	2.48	2.41	2.28	2.15	2.32	2.07	2.04	2.21
29	2.47	.....	2.30	2.64	2.38	2.40	2.26	2.08	2.06	2.06	2.10	2.19
30	2.44	.....	2.26	2.54	2.28	2.34	2.20	2.10	2.06	2.02	2.13	2.28
31	2.48	.....	2.26	.....	2.25	.....	2.26	2.09	.....	2.02	.....	2.38

NOTE.—Relation of gage height to discharge affected by ice about Dec. 8 to 23.

BIG REED ISLAND CREEK NEAR ALLISONIA, VA.

This station, which is located at J. P. Thomas's farm, about 1½ miles from Allisonia, Va., was established July 31, 1908.

The drainage area above the section is about 291 square miles. Little Reed Island Creek is tributary on the left bank a short distance below the station.

Discharge measurements are made from a suspension footbridge at Thomas's farm.

A vertical staff gage is fastened to a tree on the left bank about 1,200 feet above the bridge. The datum of the gage has remained unchanged.

The records are reliable and accurate. Sufficient data have not been obtained to enable estimates of the flow to be made.

Discharge measurements of Big Reed Island Creek near Allisonia, Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 16	C. T. Bailey	203	276	0.69	344
Oct. 24	.....do	201	263	0.52	254

Daily gage height, in feet, of Big Reed Island Creek near Allisonia, Va., for 1910.

[Arie Lilly, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.65	2.1	0.60	0.6	0.6	0.7	0.6	1.0	0.4	0.5	0.5
2	1.0	.75	1.35	.5	.6	.6	.6	.6	0.95	.4	.5	.5
3	1.05	.85	.85	.65	.6	.6	.75	.5	.85	.4	.5	.5
4	.8	.7	.75	.95	.6	.6	.8	.5	1.2	.4	.5	.6
5	.65	.75	.7	.75	.6	.7	.65	.6	.85	.4	.5	.6
6	.65	.95	.8	.7	.6	.9	.6	.6	.65	.4	.5	1.25
7	2.0	.95	.8	.6	.6	.75	1.1	.6	.6	2.15	.5	.8
8	1.0	.95	.8	.6	.6	.65	1.1	.5	.65	1.4	.5	.6
9	.85	.85	.8	.6	.6	.65	.95	.5	.7	1.65	.5	.6
10	.65	.8	.8	.6	.6	1.05	.75	.5	.55	.85	.5	.6
11	.65	.85	.8	.6	.6	1.35	.6	.5	.5	.7	.45	.5
12	.6	.65	.7	.6	.65	2.85	1.3	.5	.5	.7	.4	.5
13	.65	.95	.7	.95	.6	3.4	1.3	.5	.5	.6	.4	.5
14	.65	.85	.7	.75	.6	2.65	1.25	.5	.5	.5	.45	.5
15	.6	.9	.7	.7	.6	1.85	.95	.5	.5	.5	.5	.6
16	.6	.95	.7	.6	.6	1.55	.8	.5	.5	.5	.5	.7
17	.6	1.45	.7	.9	.6	1.25	1.2	.5	.5	.5	.4	.6
18	.6	2.65	.7	1.1	.7	1.15	1.1	.5	.5	.5	.4	.7
19	.65	1.3	.7	.8	.6	1.1	.95	.5	.4	.55	.5	.5
20	.6	.95	.7	.8	.6	1.1	.75	.5	.4	.75	.5	.5
21	1.7	1.1	.7	.8	.7	1.2	.7	.5	.4	.6	.5	.5
22	1.3	.95	.7	.75	.7	.95	.7	.5	.4	.6	.5	.5
23	.85	.95	.6	.7	1.2	.95	.7	.5	.4	.6	.5	.6
24	.75	.95	.6	.6	1.0	1.05	.65	.5	.4	.5	.5	.....
25	.7	1.0	.6	.7	1.15	.95	.6	.8	.4	.5	.5	.....
26	.7	.85	.6	.8	1.2	.85	.55	.8	.4	.5	.5	.....
27	.65	.85	.6	.7	.85	.8	.6	.85	.4	.5	.5	.....
28	.65	1.3	.6	.7	.8	.8	.6	.6	.5	.6	.55	.....
29	.65	.....	.6	.6	.7	.7	.6	.5	.45	.5	.55	.....
30	.65	.....	.6	.6	.7	.7	.6	.65	.4	.5	.5	.....
31	.6	.....	.6	.....	.7	.....	.65	.75	.....	.5	.....	.....

NOTE.—Relation of gage height to discharge affected by ice Jan. 1 to 25, Feb. 7 to 13, and Dec. 13 to 24. On Dec. 24 the gage was torn away by the ice going out.

LITTLE RIVER NEAR COPPER VALLEY, VA.

This station, which is located at the highway bridge about 5 miles south of Childress and 1 mile north of Copper Valley, Va., was established July 28, 1908.

Indian Creek enters about 600 feet below the station. The drainage area above the section is about 195 square miles.

The datum of the chain gage, attached to the bridge, has remained unchanged.

The records are reliable and accurate. Sufficient data have not been obtained to enable estimates of the flow to be made.

Discharge measurements of Little River near Copper Valley, Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 14	C. T. Bailey	153	300	3.60	228
Oct. 19	do	148	274	3.41	155

Daily gage height, in feet, of Little River near Copper Valley, Va., for 1910.

[Thos. A. De Hart, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.54	3.47	4.78	3.39	3.44	3.28	3.52	3.42	4.14	3.44	3.35	3.22
2	3.72	3.73	4.54	3.49	3.43	3.28	3.47	3.41	3.78	3.35	3.37	3.22
3	3.92	3.74	4.10	3.54	3.46	3.25	3.45	3.43	3.55	3.30	3.40	3.34
4	3.78	3.93	3.90	3.80	3.46	3.22	3.67	3.43	4.01	3.27	3.38	3.32
5	3.62	3.80	3.80	3.59	3.42	3.37	3.66	3.46	3.76	3.25	3.35	3.45
6	3.52	3.74	3.93	3.50	3.38	3.69	3.65	3.42	3.54	3.28	3.28	3.71
7	4.61	3.48	4.00	3.44	3.40	3.45	3.69	3.38	3.42	4.30	3.32	3.64
8	3.71	3.84	3.79	3.37	3.59	3.32	3.85	3.39	3.42	4.31	3.35	3.66
9	3.44	3.70	3.72	3.36	3.74	3.30	3.81	3.41	3.38	4.76	3.32	3.66
10	3.65	3.76	3.69	3.30	3.59	3.51	3.62	3.37	3.40	3.76	3.34	3.64
11	3.60	3.83	3.69	3.34	3.49	3.92	3.55	3.37	3.36	3.56	3.32	3.58
12	3.60	3.78	3.68	3.42	3.41	5.19	3.53	3.36	3.38	3.54	3.31	3.36
13	3.65	3.78	3.62	3.84	3.43	5.77	3.81	3.32	3.41	3.44	3.27	3.25
14	3.55	3.83	3.54	3.66	3.41	5.82	4.09	3.35	3.36	3.42	3.30	3.31
15	3.52	3.80	3.49	3.48	3.41	4.75	4.07	3.37	3.38	3.42	3.44	3.43
16	3.55	3.90	3.47	3.47	3.37	4.65	3.69	3.45	3.36	3.38	3.41	3.50
17	3.50	4.73	3.49	4.06	3.36	4.27	4.68	3.43	3.32	3.38	3.32	3.34
18	3.49	6.00	3.48	4.14	3.41	4.02	4.82	3.43	3.30	3.38	3.32	3.35
19	3.51	4.12	3.47	3.80	3.55	3.85	4.09	3.43	3.28	3.34	3.35	3.40
20	3.40	4.00	3.48	3.69	3.42	3.73	3.80	3.41	3.31	3.85	3.28	3.31
21	4.58	4.14	3.48	3.64	3.41	3.85	3.65	3.38	3.30	3.56	3.28	3.33
22	4.23	4.10	3.48	3.59	3.47	3.85	3.59	3.39	3.31	3.47	3.31	3.40
23	3.82	3.96	3.46	3.56	3.43	3.91	3.57	3.41	3.26	3.44	3.35	3.29
24	3.66	3.79	3.44	3.54	3.59	3.89	3.75	3.36	3.26	3.37	3.30	3.59
25	3.50	3.66	3.43	3.52	3.71	4.45	3.55	3.45	3.25	3.36	3.30	3.65
26	3.73	3.68	3.39	3.67	3.65	3.81	3.49	3.53	3.33	3.38	3.32	3.70
27	3.46	3.66	3.40	3.69	3.53	3.69	3.45	3.52	3.48	3.38	3.30	3.63
28	3.48	3.97	3.39	3.60	3.37	3.59	3.47	3.47	3.32	3.42	3.34	3.47
29	3.43	.....	3.42	3.53	3.33	3.57	3.46	3.38	3.30	3.40	3.52	3.53
30	3.63	.....	3.42	3.48	3.37	3.55	3.45	3.38	3.36	3.36	3.41	3.73
31	4.13	.....	3.48	.....	3.36	.....	3.47	4.35	.....	3.37	.....	3.89

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1–25, Feb. 7–17, and Dec. 1–24.

WALKER CREEK AT STAFFORDSVILLE, VA.

This station, which is located at the highway bridge at Staffordsville, Va., was established July 24, 1908.

Whitley Creek enters a short distance above the station. The drainage area above the section is about 277 square miles. A dam and power plant about 250 feet above the station may modify the flow in extreme low water.

The datum of the chain gage attached to the bridge has remained unchanged.

The records are reliable and accurate. Sufficient data have not been obtained to enable estimates of the flow to be made.

Discharge measurements of Walker Creek at Staffordsville, Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 12	C. T. Bailey	110	188	410	358
Apr. 29	.....do	111	224	430	476
Oct. 18	.....do	80	84.5	296	56.6

Daily gage height, in feet, of Walker Creek at Staffordsville, Va., for 1910.

[W. E. Durham, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.18	3.64	4.62	3.30	4.02	3.36	3.44	3.08	3.08	2.94	2.92	3.06
2	3.29	3.68	4.84	3.31	3.87	3.33	3.38	3.08	3.12	2.93	2.99	2.94
3	3.66	3.86	4.66	3.37	3.76	3.27	3.39	3.02	3.40	2.92	2.92	2.90
4	3.81	4.28	4.46	3.50	3.74	3.26	3.46	3.15	3.40	2.90	2.96	2.99
5	3.60	4.25	4.37	3.52	3.70	3.41	3.54	3.16	3.36	2.92	2.92	3.02
6	3.68	4.14	3.51	3.42	3.60	4.00	3.56	3.10	3.22	2.86	2.86	3.14
7	5.65	3.70	4.94	3.34	3.61	3.99	3.64	3.12	3.16	2.92	2.85	3.39
8	5.08	3.95	4.65	3.30	3.78	3.73	3.86	3.11	3.04	3.04	2.86	3.22
9	4.46	3.90	4.54	3.30	3.79	3.62	3.58	3.16	3.04	3.16	2.95	3.13
10	4.06	3.81	4.36	3.30	3.77	3.82	3.51	3.10	3.00	3.12	2.90	3.10
11	3.86	3.71	4.17	3.24	3.70	5.34	3.40	3.00	2.99	3.03	2.88	3.10
12	3.92	3.52	4.06	3.36	3.68	5.50	3.70	3.00	3.00	3.00	2.94	3.05
13	3.78	3.74	3.96	5.00	3.68	8.25	3.74	2.92	3.01	2.95	2.90	2.98
14	3.70	3.61	3.86	4.54	3.64	7.71	3.60	2.90	2.99	2.94	2.82	2.89
15	3.65	3.72	3.82	4.20	3.59	6.42	3.50	2.91	2.96	2.88	2.90	2.96
16	3.52	3.92	3.74	4.03	3.55	5.77	3.42	2.92	3.00	2.90	2.91	2.99
17	3.56	5.28	3.72	4.19	3.52	5.82	3.54	2.90	2.92	2.84	2.94	2.90
18	3.61	6.52	3.63	4.64	3.54	5.30	3.76	2.88	2.86	2.88	2.94	3.02
19	3.98	5.30	3.62	4.52	3.61	4.80	3.70	2.80	2.92	2.90	2.88	3.05
20	4.03	4.82	3.60	4.35	3.59	4.62	3.64	2.86	2.96	2.98	2.91	3.05
21	6.08	4.66	3.60	4.21	3.60	4.42	3.46	3.01	2.95	2.97	2.86	2.91
22	6.15	4.56	3.56	4.08	3.57	4.27	3.38	2.96	2.84	3.00	2.89	2.90
23	5.10	4.31	3.51	3.99	3.50	4.04	3.32	2.94	2.72	2.97	2.92	3.14
24	4.62	4.16	3.48	4.03	3.48	3.93	3.26	2.89	2.92	2.89	2.83	3.29
25	4.36	4.04	3.46	4.04	3.74	3.86	3.24	2.89	2.85	2.96	2.87	3.41
26	4.16	4.00	3.40	4.28	3.82	3.78	3.20	2.98	2.90	2.98	2.90	3.36
27	4.05	3.94	3.36	4.32	3.74	3.68	3.18	3.00	2.94	2.97	2.97	3.34
28	3.98	3.97	3.39	4.32	3.60	3.62	3.14	3.06	2.95	2.94	3.00	3.31
29	4.00	.....	3.40	4.22	3.50	3.56	3.14	3.02	2.90	2.96	3.05	3.32
30	3.76	.....	3.38	4.14	3.50	3.51	3.11	3.00	2.99	2.90	3.10	3.60
31	3.92	.....	3.34	.....	3.46	.....	3.10	3.12	.....	2.93	.....	3.80

NOTE.—No ice reported by observer; relation of gage height to discharge probably not affected by ice.

WOLF CREEK NEAR NARROWS, VA.

This station, which is located at a highway bridge about 3 miles above Narrows, Va., was established July 22, 1908.

Mill Creek is the most important tributary below the station.

The drainage area above the station is about 223 square miles.

The datum of the chain gage attached to the highway bridge has remained unchanged.

The records are reliable and accurate. Sufficient data have not been obtained to enable estimates of the flow to be made.

Discharge measurements of Wolf Creek near Narrows, Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 11	C. T. Bailey	85	210	3.71	345
21	.....do	78	158	3.22	194
Apr. 28	.....do	85	223	4.00	508
Oct. 18	.....do	76	96.6	2.42	33.3

Daily gage height, in feet, of Wolf Creek near Narrows, Va., for 1910.

[John A. Hale, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.74	3.38	4.06	2.96	3.66	3.25	3.19	2.75	2.64	2.55	2.47	2.78
2	2.85	3.18	4.14	2.94	3.53	3.18	3.11	2.71	2.70	2.53	2.47	2.66
3	3.70	3.52	4.06	3.00	3.46	3.12	3.12	2.72	2.78	2.51	2.46	2.64
4	3.65	4.06	3.92	3.12	3.48	3.06	3.06	2.71	2.80	2.51	2.46	2.71
5	3.46	3.92	3.80	3.16	3.42	3.36	3.11	2.98	2.70	2.47	2.44	2.71
6	3.36	3.80	3.95	3.08	3.35	4.40	3.38	2.86	2.72	2.45	2.44	2.98
7	5.05	3.44	4.14	3.04	3.32	4.08	3.32	2.76	2.73	2.55	2.44	3.32
8	4.35	3.54	4.02	3.02	3.50	3.81	3.32	2.76	2.67	2.63	2.43	2.98
9	3.86	3.49	3.86	2.98	3.46	3.61	3.35	2.94	2.69	2.63	2.43	2.92
10	3.59	3.56	3.74	2.96	3.48	3.62	3.24	2.76	2.70	2.59	2.42	2.89
11	3.40	3.42	3.71	2.92	3.44	3.90	3.18	2.74	2.73	2.55	2.44	2.90
12	3.34	3.31	3.62	2.96	3.42	4.42	3.14	2.70	2.73	2.51	2.44	2.88
13	3.30	3.34	3.58	3.38	3.56	5.08	3.03	2.68	2.71	2.50	2.44	2.87
14	3.28	3.28	3.54	3.62	3.54	5.35	3.10	2.66	2.63	2.47	2.44	2.72
15	3.21	3.33	3.48	3.50	3.48	4.75	3.04	2.64	2.59	2.47	2.42	2.74
16	3.12	3.52	3.40	3.42	3.40	4.62	3.00	2.64	2.60	2.48	2.46	2.76
17	3.12	4.38	3.32	3.52	3.36	5.40	3.03	2.66	2.56	2.48	2.45	2.66
18	3.35	4.98	3.30	3.82	3.43	4.75	3.42	2.60	2.51	2.43	2.44	2.60
19	4.36	4.40	3.28	3.74	3.46	4.28	3.50	2.65	2.54	2.44	2.44	2.76
20	4.02	4.10	3.26	3.72	3.38	4.06	3.32	2.67	2.53	2.50	2.46	2.80
21	5.35	3.96	3.26	3.68	3.36	3.88	3.18	2.66	2.53	2.48	2.48	2.66
22	5.20	3.90	3.22	3.80	3.30	4.22	3.07	2.60	2.51	2.54	2.46	2.60
23	4.45	3.78	3.18	3.75	3.24	4.25	3.00	2.60	2.51	2.54	2.45	2.78
24	4.04	3.68	3.11	4.04	3.20	3.94	3.02	2.58	2.50	2.54	2.44	3.14
25	3.83	3.56	3.08	4.22	4.04	3.98	2.90	2.58	2.49	2.50	2.46	3.42
26	3.72	3.48	3.06	4.20	4.20	3.83	2.85	2.63	2.55	2.52	2.44	3.22
27	3.62	3.42	3.05	4.10	3.81	3.62	2.81	2.62	2.53	2.47	2.48	3.12
28	3.66	3.44	3.02	4.02	3.64	3.48	2.80	2.62	2.57	2.44	2.60	3.06
29	3.62	.....	3.01	3.90	3.49	3.36	2.78	2.62	2.63	2.46	3.18	3.02
30	3.44	.....	3.00	3.78	3.42	3.28	2.76	2.60	2.57	2.52	3.00	3.70
31	3.52	.....	2.98	.....	3.28	.....	2.80	2.60	.....	2.49	.....	4.10

NOTE.—Mush ice is reported Dec. 15; relation of gage height to discharge probably not affected by ice.

BLUESTONE RIVER AT LILLY, W. VA.

This station, which is located about 2,000 feet below the mouth of Little Bluestone River at Lilly, W. Va., was established August 22, 1908.

The drainage area above the station is about 454 square miles.

Discharge measurements are made by means of a boat or by wading. A staff gage in two sections is fastened to trees on the left bank below the measuring section. The gage datum has remained unchanged.

The records are reliable and accurate. Sufficient data have not been obtained to enable estimates of the flow to be made.

Discharge measurements of Bluestone River at Lilly, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 9	Horton and Bailey	153	540	2.66	570
Aug. 24	Bailey and Dort	43	75.2	1.23	[a] 71.9

[a] Measurement made by wading, not at regular section.

Daily gage height, in feet, of Bluestone River at Lilly, W. Va., for 1910.

[W. H. Lilly, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.45	4.70	1.58	2.48	2.00	1.73	1.41	1.57	1.14	1.09	1.65
2	.....	2.90	4.38	1.54	2.32	1.92	1.58	1.46	1.65	1.10	1.04	1.45
3	3.10	2.68	3.62	1.59	2.21	1 92	1.45	1.42	1.82	1.10	1.06	1.35
4	2.70	3.35	3.22	2.20	2.13	1.84	2.15	1.40	1.91	1.04	1.02	1.44
5	2.45	3.42	2.82	2.54	2.05	2.68	3.35	1.36	1.92	.99	1.04	1.38
6	2.38	2.95	2.76	2.28	1.98	4.40	3.05	1.30	1.80	.96	1.02	2.30
7	3.95	2.85	3.30	2.10	1.92	3.45	2.65	1.35	1.44	.98	1.02	2.75
8	3.55	2.55	2.92	1.98	2.14	2.78	3.05	1.29	1.34	1.02	1.00	2.15
9	2.72	2.45	2.62	1.88	2.46	2.48	2.88	1.20	1.34	1.06	.98	1.90
10	2.55	2.45	2.50	1.82	2.64	2.46	2.62	1.20	1.26	1.02	.94	1.90
11	2.45	2.50	2.48	1.74	2.47	2.82	2.45	1.16	1.26	1.02	.98	1.78
12	2.31	2.32	2.48	1.72	2.40	3.45	2.27	1.11	1.22	1.04	.98	1.82
13	2.01	2.22	2.71	2.57	2.54	4.00	2.25	1.14	1.16	1.04	.90	1.65
14	2.05	2.30	2.72	2.86	2.68	3.66	2.48	1.10	1.23	1.02	.99	1.50
15	1.95	2.28	2.58	2.60	2.45	3.70	2.70	1.07	1.14	.94	.96	1.45
16	2.12	3.35	2.38	2.46	2.32	5.15	2.30	1.14	1.07	.96	.96	1.38
17	1.82	4.25	2.28	2.36	2.18	6.10	2.60	1.00	1.12	.98	.92	1.40
18	2.65	4.02	2.18	2.46	2.36	4.20	6.75	1.00	1.07	.94	.92	1.35
19	4.75	3.25	2.02	2.60	2.80	3.29	4.65	1.02	.99	.84	.99	1.38
20	3.70	2.76	1.99	2.59	2.50	2.95	4.40	1.07	.99	.83	.94	1.42
21	4.40	2.70	1.92	2.86	2.53	2.95	3.10	1.11	.98	.86	.88	1.38
22	4.60	2.75	1.92	3.34	2.40	2.70	2.32	1.26	.92	.98	.88	1.32
23	3.45	2.81	1.86	3.18	2.26	2.75	2.15	1.24	.97	.99	.79	1.15
24	2.95	2.72	1.82	3.62	2.16	2.68	1.99	1.16	.96	.98	.79	1.45
25	2.65	2.50	1.68	4.02	2.22	2.85	1.88	1.10	.98	1.04	.80	1.62
26	2.50	2.36	1.68	3.45	2.27	2.40	1.76	1.16	1.00	1.04	.85	2.00
27	2.60	2.30	1.70	3.12	2.18	2.29	1.70	1.19	1.35	1.02	.98	1.98
28	2.90	2.54	1.68	2.94	2.05	2.48	1.48	1.20	1.20	1.00	1.05	1.95
29	2.80	.....	1.62	2.82	1.92	1.88	1.40	1.18	1.15	1.02	2.05	2.04
30	2.50	.....	1.61	2.68	2.18	1.79	1.44	1.10	1.24	1.04	2.00	2.79
31	2.45	.....	1.60	.....	2.65	.....	1.41	1.06	.....	1.04	.....	3.00

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 to 3 and Dec. 18 to 26.

GREENBRIER RIVER NEAR MARLINTON, W. VA.

This station, which is located at the Chesapeake & Ohio Railway bridge on the spur that runs to Campbell's lumber mill near Marlinton, W. Va., was established July 9, 1908.

Stoney Creek enters immediately above the station. The drainage area above the section is about 408 square miles.

The datum of the chain gage attached to the railroad bridge has remained unchanged.

The records are reliable and accurate. Sufficient data have not been obtained to enable estimates of the flow to be made.

Discharge measurements of Greenbrier River near Marlinton, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 22	J. C. Dort	183	318	3.88	264
Oct. 10	C. T. Bailey	183	319	3.77	233

Daily gage height, in feet, of Greenbrier River near Marlinton, W. Va., for 1910.

[Paris G. Johnston, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	(a)	4.12	7.25	3.76	4.44	4.02	3.83	3.44	3.68	3.59	3.38	3.84
2	.....	4.10	6.32	3.76	4.26	4.02	3.79	3.42	4.12	3.49	3.44	3.96
3	.....	4.09	5.15	3.74	4.12	4.06	3.83	3.40	3.96	3.37	3.46	3.86
4	.....	4.07	5.35	3.76	4.06	4.08	3.86	3.36	4.22	3.30	3.42	(b)
5	.....	4.05	5.05	3.81	3.98	5.48	3.90	3.44	4.65	3.34	3.40	.....
6	.....	4.05	5.00	3.82	3.85	6.15	3.96	3.41	4.50	3.40	3.38	.....
7	.....	4.04	4.95	3.80	3.82	5.81	3.99	3.38	4.18	3.36	3.36	.....
8	.....	4.04	4.79	3.80	3.88	5.19	4.04	3.37	3.86	3.48	3.35	.....
9	4.71	4.12	4.49	3.76	3.92	4.38	4.01	3.36	3.73	3.86	3.34	.....
10	4.59	4.10	4.40	3.72	3.90	4.92	3.98	3.35	3.67	3.79	3.34	.....
11	4.30	4.10	4.45	3.70	3.86	6.26	3.92	3.36	3.60	3.71	3.32	.....
12	4.25	4.09	4.40	3.74	3.84	6.48	3.86	3.42	3.52	3.62	3.31	.....
13	4.20	4.08	4.36	4.10	4.12	6.79	3.81	3.54	3.51	3.52	3.30	.....
14	4.05	4.15	4.34	4.21	4.64	6.80	3.91	3.48	3.60	3.46	3.30	.....
15	4.04	4.19	4.31	4.12	4.58	6.15	4.16	3.44	3.56	3.42	3.28	.....
16	4.02	4.30	4.28	4.05	4.38	10.30	4.38	3.38	3.50	3.38	3.28	.....
17	4.00	6.00	4.21	4.10	4.25	8.62	4.54	3.38	3.46	3.38	3.27	3.85
18	4.12	7.89	4.13	4.24	4.17	6.39	4.42	3.48	3.40	3.36	3.26	.....
19	5.55	5.72	4.00	4.38	4.10	5.78	4.30	3.46	3.41	3.35	3.26	.....
20	4.95	5.40	3.96	4.46	4.08	5.46	4.18	3.42	3.42	3.34	3.24	.....
21	6.24	5.19	3.92	4.48	4.30	5.24	4.04	3.45	3.36	3.32	3.24	.....
22	6.34	5.50	3.91	4.45	4.30	5.04	3.92	3.86	3.34	3.32	3.23	.....
23	5.52	5.58	3.90	4.44	4.24	4.86	3.86	3.74	3.32	3.30	3.25	.....
24	4.84	5.10	3.90	4.65	4.19	4.70	3.82	3.55	3.30	3.42	3.77	.....
25	4.53	4.75	3.90	4.80	4.38	4.47	3.73	3.46	3.58	3.46	3.92	.....
26	4.30	4.50	3.90	4.78	4.36	4.29	3.64	3.41	3.90	3.39	3.82	.....
27	4.34	4.26	3.88	4.76	4.24	4.16	3.58	3.37	4.04	3.34	3.74	.....
28	4.29	5.17	3.86	4.85	4.15	4.05	3.56	3.34	3.90	3.32	3.59	.....
29	4.20	.....	3.84	4.75	4.14	3.96	3.53	3.32	3.78	3.46	3.78	.....
30	4.17	.....	3.82	4.61	4.08	3.88	3.50	3.30	3.68	3.46	3.93	.....
31	4.15	.....	3.80	.....	4.06	.....	3.46	3.32	.....	3.42	.....	.....

a Jan. 1 to 8, gage not read because of illness of observer.
b Dec. 4 to 31, gage record lost by observer.

NOTE.—Relation of gage height to discharge affected by ice about Dec. 10 to 26.

GREENBRIER RIVER AT ALDERSON, W. VA.

This station, which is located at the highway bridge at Alderson, W. Va., was established August 1, 1895, discontinued July 15, 1906, and reestablished May 10, 1907.

Muddy Creek, the only important tributary in the immediate vicinity of this station, enters from the right about half a mile below the bridge.

The drainage area above the station is about 1,340 square miles.

The accuracy of the records is little affected by ice. The datum of the chain gage attached to the bridge has remained the same since the installation of the station.

Conditions of flow are nearly permanent and a good rating curve has been developed.

Discharge measurements of Greenbrier River at Alderson, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 23	J. C. Dort	305	279	1.78	163
Oct. 11	C. T. Bailey	367	499	2.30	572

Daily gage height, in feet, of Greenbrier River at Alderson, W. Va., for 1910.

[W. J. Hancock, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.20	2.60	4.50	2.35	3.30	2.50	2.52	2.00	1.90	2.22	1.92	2.40
2	2.20	2.50	6.50	2.30	3.05	2.48	2.42	1.98	1.90	2.08	1.92	2.28
3	2.45	2.60	4.80	3.32	2.88	2.45	2.38	1.95	2.25	2.05	1.90	2.15
4	4.55	2.80	4.60	2.52	2.78	2.42	2.35	1.90	2.75	2.00	1.90	2.10
5	4.00	3.00	4.10	2.75	2.72	2.55	2.45	2.02	3.05	1.90	1.82	2.15
6	3.40	2.90	3.80	2.70	2.58	3.90	2.52	2.08	3.00	1.82	1.80	2.15
7	4.40	2.70	3.70	2.70	2.50	4.65	2.65	2.00	2.80	1.90	1.80	2.10
8	5.55	2.50	3.60	2.58	2.55	3.75	2.62	1.98	2.55	1.90	1.80	2.02
9	4.20	2.50	3.40	2.52	2.72	3.30	2.75	1.90	2.35	1.82	1.80	2.00
10	3.70	2.70	3.20	2.48	2.75	3.32	2.72	1.90	2.22	2.32	1.80	2.12
11	3.50	2.70	3.10	2.40	2.72	4.90	2.55	1.85	2.15	2.32	1.78	2.10
12	2.80	2.40	3.00	2.45	2.70	5.75	2.42	1.82	2.08	2.18	1.72	2.05
13	2.70	2.50	3.00	3.08	2.90	6.40	2.95	1.85	2.10	2.05	1.75	2.05
14	2.80	2.50	3.10	3.20	3.25	7.28	3.40	1.78	2.22	1.98	1.75	2.08
15	2.70	2.60	3.18	3.12	3.10	5.70	3.18	1.90	2.20	1.88	1.75	1.82
16	2.60	2.80	3.10	2.95	2.95	7.32	3.10	1.95	2.08	1.85	1.75	2.00
17	2.50	4.00	2.98	2.90	2.78	12.75	2.92	1.90	2.00	1.85	1.75	2.00
18	2.50	7.40	2.85	3.08	2.75	6.60	3.52	1.78	1.92	1.80	1.80	1.92
19	3.60	6.40	2.78	3.20	2.72	4.80	4.30	1.80	1.90	1.80	1.80	2.05
20	4.50	4.50	2.68	3.25	2.70	5.32	3.38	1.80	1.82	1.82	1.75	2.00
21	4.00	3.90	2.60	3.30	2.70	4.40	2.95	1.78	1.80	1.78	1.75	2.15
22	7.45	3.90	2.60	3.30	2.95	3.95	2.72	1.85	1.80	1.78	1.72	2.20
23	5.10	4.70	2.55	3.25	2.92	3.92	2.55	1.78	1.78	1.80	1.72	2.10
24	4.10	4.20	2.55	3.35	2.88	4.15	2.45	2.38	1.78	1.90	1.78	2.25
25	3.60	3.80	2.50	3.75	2.88	3.50	2.30	2.15	1.75	1.88	1.72	2.82
26	3.20	3.50	2.50	3.62	2.88	3.10	2.20	2.10	1.92	1.90	1.75	2.85
27	3.10	3.50	2.50	3.50	2.80	2.85	2.20	1.98	2.85	1.92	2.02	2.75
28	3.00	3.60	2.50	3.65	2.72	2.80	2.20	1.90	2.45	1.90	2.10	2.62
29	3.00	.....	2.38	3.65	2.58	2.72	2.12	1.82	2.80	1.85	2.30	2.70
30	2.80	.....	2.40	3.48	2.52	2.62	2.10	1.78	2.42	1.90	2.45	5.05
31	2.70	.....	2.40	.....	2.50	.....	2.08	1.80	.....	1.90	.....	5.65

Daily discharge, in second-feet, of Greenbrier River at Alderson, W. Va., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	490	1,000	5,420	659	2,380	855	884	315	246	512	260	720
2	490	855	11,300	598	1,820	828	747	301	246	380	260	576
3	788	1,000	6,240	2,400	1,480	788	696	280	544	356	246	443
4	5,560	1,330	5,690	884	1,300	747	659	246	1,240	315	246	396
5	4,100	1,720	4,360	1,240	1,190	928	788	331	1,820	246	200	443
6	2,620	1,520	3,600	1,160	971	3,850	884	380	1,720	200	188	443
7	5,150	1,160	3,350	1,160	855	5,820	1,080	315	1,330	246	188	396
8	8,380	855	3,100	971	928	3,480	1,030	301	928	246	188	331
9	4,620	855	2,620	884	1,190	2,380	1,240	246	659	200	188	315
10	3,350	1,160	2,140	828	1,240	2,420	1,190	246	512	622	188	415
11	2,860	1,160	1,920	720	1,190	6,520	928	217	443	622	178	396
12	1,330	720	1,720	788	1,160	8,960	747	200	380	471	150	356
13	1,160	855	1,720	1,880	1,520	10,900	1,620	217	396	356	164	356
14	1,330	855	1,920	2,140	2,260	13,900	2,620	178	512	301	164	380
15	1,160	1,000	2,100	1,970	1,920	8,810	2,100	246	490	234	164	200
16	1,000	1,330	1,920	1,620	1,620	14,000	1,920	280	380	217	164	315
17	855	4,100	1,680	1,520	1,300	34,500	1,560	246	315	217	164	315
18	855	14,300	1,420	1,880	1,240	11,600	2,900	178	260	188	188	260
19	3,100	10,900	1,300	2,140	1,190	6,240	4,880	188	246	188	188	356
20	5,420	5,420	1,130	2,260	1,160	7,710	2,570	188	200	200	164	315
21	4,100	3,850	1,000	2,380	1,160	5,150	1,620	178	188	178	164	443
22	14,500	3,850	1,000	2,380	1,620	3,980	1,190	217	188	178	150	490
23	7,080	5,960	928	2,260	1,540	3,900	928	178	178	188	150	396
24	4,360	4,620	928	2,500	1,480	4,490	788	696	178	246	178	544
25	3,100	3,600	855	3,480	1,480	2,860	598	443	164	234	150	1,370
26	2,140	2,860	855	3,150	1,480	1,920	490	396	260	246	164	1,420
27	1,920	2,860	855	2,860	1,330	1,420	490	301	1,420	260	331	1,240
28	1,720	3,100	855	3,220	1,190	1,330	490	246	788	246	396	1,030
29	1,720	.....	696	3,220	971	1,190	415	200	1,330	217	598	1,160
30	1,330	.....	720	2,810	884	1,030	396	178	747	246	788	6,940
31	1,160	.....	720	.....	855	.....	380	188	.....	246	.....	8,660

NOTE.—Daily discharge determined by means of a discharge rating curve that is well defined between 46 and 8,230 second-feet (gage heights 1.4 and 5.5 feet) fairly well defined between 8,520 and 16,400 second-feet (gage heights 5.6 and 8.0 feet) and poorly defined above discharge 16,400 second-feet (gage height 8.0 feet). Relation of gage height to discharge probably not affected by ice. Observer reported river open at station all season. Observer reported ice 8 inches thick above and below station Jan. 1.

Monthly discharge of Greenbrier River at Alderson, W. Va., for 1910.

[Drainage area, 1,340 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	14,500	490	3,150	2.35	2.71	A.
February	14,300	720	2,960	2.21	2.30	A.
March	11,300	696	2,390	1.78	2.05	A.
April	3,480	598	1,870	1.40	1.56	A.
May	2,380	855	1,350	1.01	1.16	A.
June	34,500	747	5,750	4.29	4.79	A.
July	4,880	380	1,250	.933	1.08	A.
August	696	178	268	.200	.23	B.
September	1,820	164	610	.455	.51	A.
October	622	178	284	.212	.24	B.
November	788	150	230	.172	.19	B.
December	8,660	200	1,010	.754	.87	A.
The year	34,500	150	1,750	1.31	17.69	

GAULEY RIVER AT ALLINGDALE, W. VA.

This station, which is located at the Baltimore & Ohio Railroad bridge about one-fourth mile south of the depot at Allingdale, W. Va., was established July 3, 1908.

Rock Creek enters immediately above the station. The drainage area above the section is about 248 square miles.

The section at this station is located at a bridge on a curve. The bottom of the stream is rough, but with care accurate measurements can be made. The datum of the chain gage, attached to the railroad bridge, has remained unchanged.

The records are reliable and accurate. Sufficient data have not been obtained to enable estimates of the flow to be made.

Discharge measurements of Gauley River at Allingdale, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 12	A. H. Horton	156	506	5.48	[a] 371
12	do	154	694	5.47	406
Aug. 15	Bailey and Dort	109	109	4.43	[b] 77.4

[a] Above regular section. [b] Measurement not at regular section.

Daily gage height, in feet, of Gauley River at Allingdale, W. Va., for 1910.

[J. L. Cogar, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug	Sept.	Oct.	Nov.	Dec.
1	4.85	5.50	8.95	5.03	5.52	5.45	5.20	4.65	4.64	5.20	5.03	5.70
2	5.96	5.80	7.58	5.00	5.41	6.30	5.05	4.62	4.40	5.10	5.07	5.61
3	8.85	5.50	7.12	4.99	5.30	5.96	4.94	4.59	4.97	5.02	5.10	5.45
4	8.55	5.80	6.68	5.03	5.30	5.94	4.92	4.55	5.15	4.95	5.25	5.43
5	6.99	5.80	6.32	5.55	5.25	5.90	6.49	4.70	5.36	4.80	5.20	5.45
6	6.48	5.68	6.23	5.35	5.15	8.70	6.41	4.65	6.17	4.73	5.12	5.60
7	10.45	5.60	6.25	5.36	5.11	7.18	5.60	4.50	5.37	4.70	5.05	5.52
8	7.33	5.25	6.00	5.30	5.09	6.40	6.80	4.45	5.20	4.75	5.00	5.48
9	7.10	5.35	5.73	5.23	5.61	6.20	6.00	4.41	5.12	5.40	4.90	5.55
10	6.11	5.62	5.62	5.20	5.80	6.60	5.65	4.40	5.10	5.33	4.89	5.22
11	6.20	5.65	5.50	5.18	5.65	7.10	5.30	4.39	4.92	5.10	4.90	5.20
12	5.80	5.52	5.49	5.15	8.35	7.25	5.20	4.40	4.85	4.95	4.88	5.22
13	5.61	5.20	5.34	6.00	7.50	7.35	6.75	4.41	4.74	4.85	4.85	5.10
14	5.90	5.30	5.32	5.90	6.60	7.15	6.65	4.38	6.60	4.75	4.75	4.85
15	6.05	5.32	5.30	5.61	6.00	7.05	6.25	4.45	5.75	4.72	4.71	4.95
16	5.50	5.50	5.35	5.52	5.94	11.32	6.10	4.32	5.71	4.67	4.85	5.05
17	5.65	7.68	5.40	5.60	5.55	9.50	5.85	4.34	5.18	4.65	4.77	4.95
18	5.61	8.50	5.25	5.65	5.60	8.10	5.90	4.31	5.04	4.62	4.74	5.11
19	8.85	7.12	5.20	5.69	5.80	7.49	5.72	4.29	4.90	4.59	4.70	5.17
20	7.10	6.58	5.20	6.00	5.70	6.98	5.45	4.31	4.86	4.53	4.61	5.72
21	6.60	6.24	5.21	6.49	5.65	6.35	5.29	4.10	4.89	4.50	4.50	5.64
22	7.35	6.82	5.36	6.60	5.62	6.10	5.11	4.20	4.70	4.64	4.70	5.30
23	6.59	6.56	5.34	7.00	5.70	5.80	5.00	4.75	4.69	4.73	4.68	5.35
24	6.20	6.50	5.30	7.20	5.52	5.70	5.02	4.70	4.61	4.95	4.70	6.10
25	5.85	6.05	5.30	7.01	5.60	5.50	4.88	4.50	5.44	4.90	4.85	6.05
26	5.65	5.90	5.28	6.55	5.70	5.36	4.86	4.41	7.78	4.71	5.50	5.70
27	5.98	5.75	5.20	6.20	5.62	5.25	5.10	4.35	5.75	4.70	5.47	5.68
28	6.10	6.26	5.18	6.00	5.45	5.20	4.90	4.32	6.05	4.90	5.40	5.40
29	5.95	.....	5.10	5.81	5.42	5.60	4.80	4.30	5.70	5.30	6.85	5.95
30	5.70	.....	5.05	5.70	5.40	5.40	4.72	4.22	5.36	5.15	5.85	10.14
31	5.60	.....	5.04	.....	5.48	.....	4.70	4.21	.....	5.05	.....	7.95

NOTE.—No ice reported by observer; relation of gage height to discharge probably not affected by ice.

GAULEY RIVER NEAR SUMMERSVILLE, W. VA.

This station, which is located at the highway bridge known as Brock's bridge, about 2½ miles southeast of Summersville, W. Va., was established July 6, 1908, to obtain data for use in studying water power, water supply, pollution, flood control, and storage problems.

Muddlety Creek enters about one-eighth mile above the station. The drainage area above the section is about 686 square miles.

The datum of the chain gage attached to the bridge has remained unchanged.

The records are reliable and accurate. Sufficient data have not been obtained to enable estimates of the flow to be made.

Discharge measurements of Gauley River near Summersville, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 25	C. T. Bailey	200	715	5.68	702
Oct. 14	do	182	545	4.88	337

Daily gage height, in feet, of Gauley River near Summersville, W. Va., for 1910.

[J. W. Dermody, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.38	6.00	10.86	.....	5.95	5.53	4.83	4.47	3.41	5.15	5.15	6.35
2	5.60	5.90	9.72	.....	5.70	6.28	4.83	4.37	4.26	5.35	5.30	5.70
3	11.32	6.32	8.90	.....	5.50	6.33	5.30	3.92	5.81	5.10	5.55	5.95
4	11.10	7.00	8.20	.....	5.30	5.93	5.48	4.32	6.66	4.35	5.55	5.30
5	9.01	6.74	7.66	.....	5.38	6.33	7.72	3.37	6.16	4.30	5.45	5.85
6	8.20	6.63	7.50	5.10	5.10	10.58	6.62	4.32	6.96	4.60	5.25	6.40
7	12.41	5.60	7.42	5.20	4.80	8.98	7.07	3.52	5.96	4.20	5.15	6.30
8	10.31	5.82	6.98	5.46	5.10	7.48	8.42	3.61	5.21	4.75	5.05	6.00
9	8.30	6.09	6.54	5.30	6.60	6.53	7.12	3.31	4.96	5.50	5.10	5.60
10	7.47	6.65	6.28	5.15	7.00	7.23	6.32	3.61	5.46	5.75	5.00	5.80
11	6.45	6.88	6.12	4.95	6.14	7.88	5.97	3.76	4.90	5.45	4.80	5.20
12	6.38	7.00	6.00	5.30	9.18	8.03	5.07	3.36	5.17	5.00	4.75	4.95
13	6.29	6.94	6.00	6.20	9.86	8.93	8.12	3.31	4.75	5.05	4.25	5.25
14	7.34	6.75	5.92	6.15	8.65	8.78	8.27	3.51	7.65	4.85	4.55	5.15
15	7.10	6.47	5.84	6.50	6.75	8.68	7.52	3.86	5.75	4.70	4.70	5.35
16	6.76	6.88	5.79	5.75	6.50	10.68	6.42	3.81	5.60	4.35	4.75	5.50
17	6.53	9.68	5.74	6.00	5.90	10.98	6.07	3.66	5.30	4.45	4.65	5.35
18	7.84	11.39	5.60	6.25	5.95	9.48	6.12	3.26	5.00	4.45	4.50	5.80
19	11.22	9.64	5.40	6.65	6.55	8.68	5.77	3.16	4.70	4.30	4.50	6.15
20	9.24	8.46	5.33	6.85	6.05	8.53	5.57	3.61	4.75	4.20	4.25	7.05
21	9.08	7.66	5.36	7.80	6.26	8.03	5.17	3.66	4.70	4.25	4.50	6.95
22	9.80	8.28	5.80	8.65	6.40	7.88	4.62	3.11	4.50	4.40	4.40	6.75
23	8.48	9.06	5.50	9.48	6.10	6.98	4.47	3.36	4.25	5.40	4.45	6.55
24	7.68	8.19	5.48	9.54	6.21	5.98	4.62	4.01	4.35	5.15	4.55	7.25
25	7.06	7.42	5.62	8.80	6.55	5.98	4.32	4.06	6.15	4.85	4.55	7.88
26	6.70	6.72	5.55	8.10	6.20	5.48	5.12	4.36	7.00	4.40	5.54	7.10
27	7.20	6.67	5.46	7.45	6.30	5.68	5.77	3.61	6.40	4.50	6.05	6.55
28	7.56	7.78	5.34	7.15	6.05	6.58	4.72	3.31	6.25	5.15	6.70	6.30
29	7.12	.....	4.80	6.80	5.60	6.53	5.17	3.06	6.10	5.80	8.50	7.80
30	6.68	.....	4.70	6.50	5.45	5.93	4.67	3.71	5.65	5.25	7.35	14.00
31	6.46	.....	.....	.....	5.60	.....	5.17	3.26	.....	5.05	.....	10.50

NOTE.—No ice reported by observer; relation of gage height to discharge probably not affected by ice.

GAULEY RIVER AT BELVA, W. VA.

This station is located about half a mile below Belva, W. Va. It was established August 25, 1908.

Twentymile Creek enters on the right bank about one-eighth mile above the station. The drainage area above the section is about 1,420 square miles.

Discharge measurements are made by means of a boat or by wading. A staff gage is fastened to a tree on the right bank about 1,000 feet below the gaging section. The gage datum has remained unchanged.

The records are reliable and accurate. Sufficient data have not been obtained to enable estimates of the flow to be made.

Discharge measurements of Gauley River at Belva, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 8	Horton and Bailey	251	1,320	4.40	3,350
Aug. 26	C. T. Bailey	90	107	1.95	[a] 328

[a] Measurement not at regular section.

Daily gage height, in feet, of Gauley River at Belva, W. Va., for 1910.

[C. L. Davis, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.62	3.88	6.85	2.68	4.12	3.28	3.56	2.56	1.65	3.00	2.58	4.45
2	2.86	3.55	7.16	2.61	3.82	3.34	3.22	2.38	1.76	2.88	2.54	3.90
3	5.55	3.75	6.55	2.60	3.58	3.74	3.08	2.26	2.38	2.76	2.59	3.52
4	8.60	4.80	5.75	2.62	3.41	3.53	4.12	2.34	3.14	2.52	2.78	3.41
5	6.60	4.82	5.15	2.85	3.30	3.65	5.20	2.18	3.65	2.35	2.62	3.35
6	5.54	4.48	4.80	3.39	3.16	7.22	4.58	2.11	4.12	2.22	2.71	4.12
7	8.72	3.85	4.58	3.18	3.04	7.30	4.28	2.05	3.70	2.14	2.64	4.38
8	7.80	3.62	4.38	3.10	3.06	5.92	5.26	2.02	3.19	2.12	2.59	3.86
9	6.00	3.60	4.00	3.02	3.58	4.95	5.04	1.96	3.85	2.62	2.54	3.50
10	5.18	3.88	3.76	2.92	4.88	4.82	4.18	1.94	3.32	3.51	2.48	3.28
11	4.38	4.22	3.74	2.84	4.56	5.26	3.66	1.92	2.82	3.12	2.38	3.27
12	3.95	4.12	3.68	2.89	6.28	5.69	3.38	1.88	2.62	2.88	2.35	3.26
13	3.71	3.92	3.62	3.40	7.85	6.60	5.90	1.80	2.68	2.57	2.31	3.00
14	3.94	3.68	3.73	4.63	6.19	6.56	6.02	1.75	4.00	2.42	2.26	2.90
15	4.52	3.65	3.90	4.27	5.18	6.36	5.62	1.98	4.00	2.26	2.24	2.85
16	4.24	4.20	3.71	4.03	4.51	9.50	4.52	2.00	3.34	2.20	2.22	2.80
17	3.92	6.40	3.54	3.82	4.00	12.95	4.20	1.90	2.92	2.12	2.25	3.08
18	4.50	8.30	3.48	4.26	3.86	8.18	3.94	1.78	2.65	2.08	2.21	3.05
19	8.75	7.21	3.29	4.85	4.02	6.50	4.11	1.74	2.52	2.01	2.18	2.82
20	7.12	6.11	3.11	5.01	3.88	6.25	4.01	1.71	2.38	1.96	2.08	3.40
21	6.82	5.38	3.08	6.00	3.84	5.15	3.60	1.70	2.29	1.90	2.04	4.08
22	8.15	4.88	3.14	7.22	4.10	5.30	3.24	1.65	2.25	1.90	2.01	3.90
23	6.42	6.48	3.18	6.95	4.13	4.80	2.95	1.60	2.18	1.98	2.05	3.50
24	5.55	5.90	3.02	7.58	4.00	4.32	2.75	1.60	2.08	2.61	2.04	4.30
25	4.92	5.24	3.06	7.07	4.75	3.88	2.56	2.05	2.01	2.45	2.09	5.45
26	4.45	4.58	2.99	6.12	4.55	3.52	2.50	2.00	3.78	2.26	2.49	4.65
27	4.58	4.20	2.98	5.38	4.15	4.11	3.25	1.81	3.98	2.18	3.12	4.18
28	5.26	4.08	2.90	5.00	3.77	5.15	3.12	1.72	3.90	2.29	3.20	3.82
29	5.08	.....	2.84	4.72	3.50	4.75	3.10	1.64	3.89	2.62	5.38	4.05
30	4.45	.....	2.79	4.49	3.31	4.02	2.86	1.60	3.32	2.82	5.26	10.08
31	4.15	.....	2.74	.....	3.29	.....	2.62	1.61	.....	2.66	.....	8.65

NOTE.—Relation of gage height to discharge affected by ice about Dec. 16 to 23. Jan. 12, Feb. 8, and Dec. 17, observer reported ice along shores.

CHERRY RIVER AT RICHWOOD, W. VA.

This station, which is located at the highway bridge in the town of Richwood, W. Va., was established July 3, 1908.

The datum of the chain gage attached to the bridge has not been changed. During August, 1909, stones were removed from the river bed below the gage, thereby changing the relation of gage height to discharge by a slight amount.

The records are reliable and accurate. Sufficient data have not yet been obtained to enable estimates of the flow to be made.

Discharge measurements of Cherry River at Richwood, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 12	A. H. Horton	109	185	2.67	138
Aug. 16	J. C. Dort	105	128	2.27	41.4

Daily gage height, in feet, of Cherry River at Richwood, W. Va., for 1910.

[Floyd Artrip, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.62	4.55	2.50	2.78	2.60	2.62	2.28	2.48	2.70	2.60	3.05
2	3.40	2.62	3.98	2.50	2.68	2.62	2.52	2.27	2.70	2.72	2.65	2.95
3	4.58	2.60	3.65	2.50	2.65	2.65	2.50	2.25	2.90	2.58	2.70	2.80
4	4.10	2.68	3.40	2.70	2.60	2.62	2.88	2.27	3.22	2.52	2.68	2.72
5	3.35	2.62	3.22	2.70	2.55	3.32	2.92	2.27	3.52	2.45	2.60	2.68
6	3.15	2.60	3.18	2.65	2.50	3.98	2.70	2.19	3.22	2.40	2.60	2.70
7	4.60	.....	3.12	2.65	2.50	3.38	2.78	2.17	3.00	2.45	2.52	2.65
8	3.68	.....	2.95	2.65	2.65	3.10	3.10	2.22	2.78	2.95	2.50	2.60
9	3.20	2.60	2.85	2.60	2.68	2.95	2.82	2.32	2.90	3.25	2.50	2.58
10	2.95	2.75	2.78	2.60	2.70	3.10	2.60	2.27	2.82	2.90	2.45	2.50
11	2.90	2.70	2.70	2.55	2.65	3.35	2.58	2.25	2.68	2.72	2.45	2.50
12	2.80	.....	2.62	2.62	3.38	3.60	2.50	2.17	2.58	2.68	2.40	2.50
13	2.70	.....	2.60	3.08	3.30	3.70	2.92	2.75	2.88	2.58	2.40	2.50
14	2.75	.....	2.65	2.88	3.05	3.55	2.82	2.29	2.95	2.50	2.40	.....
15	2.70	.....	2.65	2.80	2.88	3.58	2.65	2.22	2.72	2.45	2.40	.....
16	2.70	2.85	2.60	2.78	2.78	5.55	2.52	2.27	2.60	2.40	2.38	.....
17	2.65	3.65	2.60	2.98	2.70	4.50	2.52	2.20	2.50	2.40	2.35	.....
18	2.88	4.20	2.55	3.25	2.85	3.60	2.65	2.15	2.45	2.38	2.35	.....
19	3.80	3.60	2.50	3.05	2.78	3.50	2.70	2.15	2.40	2.32	2.30	2.78
20	3.25	3.15	2.50	3.00	2.70	3.20	2.52	2.22	2.40	2.30	2.30	2.72
21	4.40	3.05	4.65	3.10	2.92	3.18	2.45	2.15	2.35	2.30	2.28	.....
22	3.60	3.50	2.60	3.18	2.88	3.38	2.42	2.50	2.30	2.72	2.25	.....
23	3.25	3.30	2.60	3.82	2.80	3.05	2.32	2.28	2.28	2.65	2.20	.....
24	3.05	3.05	2.60	3.68	2.75	2.85	2.30	2.20	2.22	2.50	2.30	2.75
25	2.88	3.05	2.60	3.42	2.80	2.68	2.22	2.15	4.00	2.40	3.10	3.10
26	2.78	2.90	2.60	3.25	2.72	2.58	2.80	2.15	3.40	2.40	2.78	2.80
27	2.85	2.85	2.55	3.10	2.62	2.68	2.58	2.15	2.95	2.42	2.68	2.78
28	2.80	4.00	2.55	3.05	2.58	3.22	2.50	2.15	3.20	2.85	3.35	2.78
29	2.72	.....	2.55	2.95	2.52	2.95	2.40	2.10	2.88	2.68	3.50	4.00
30	2.72	.....	2.50	2.85	2.50	2.75	2.40	2.08	2.80	2.62	3.15	5.45
31	2.68	.....	2.50	.....	2.50	.....	2.38	2.05	.....	2.60	.....	3.85

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 to 3, Feb. 6 to 17, and Dec. 10 to 24.

MEADOW RIVER NEAR RUSSELLVILLE, W. VA.

This station, which is located at Bays Ferry, about 3 miles below Russellville, W. Va., was established July 17, 1908.

Youngs Creek enters about one-fourth mile above the station. The drainage area above the station is about 297 square miles.

Discharge measurements are made by means of a cable and boat; low-water measurements are made by wading.

The chain gage is attached to trees on the left bank above the ferry. The datum of the gage has remained unchanged.

In autumn backwater is sometimes caused by leaves lodging at the rapids below the station. For short periods during January, February, and December the relation of gage height to discharge is affected by ice.

The records are reliable and accurate. Sufficient data have not been obtained to enable estimates of the flow to be made.

Discharge measurements of Meadow River near Russellville, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 24	C. T. Bailey	115	350	4.51	233
26	do	115	339	4.35	216
Oct. 14	do	102	243	3.61	62.9
15	do	99	226	3.46	47.1

Daily gage height, in feet, of Meadow River near Russellville, W. Va., for 1910.

[J. R. Bays, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.86	[a] 6.48	8.27	4.02	5.62	4.59	4.42	3.62	3.24	4.37	3.62	5.40
2	4.11	6.42	8.25	3.98	5.30	4.59	4.20	3.49	3.68	4.17	3.68	[a] 5.59
3	.....	6.26	7.63	4.02	5.00	4.52	4.14	3.47	4.25	3.89	3.71	6.34
4	8.20	6.20	6.91	4.12	4.93	4.44	4.34	3.45	4.08	3.58	3.77	5.61
5	7.31	5.73	6.33	4.89	4.78	4.71	4.27	3.43	4.95	3.46	3.82	5.16
6	6.60	[a] 6.11	5.90	4.83	4.64	8.89	4.53	3.39	4.91	3.36	3.83	4.92
7	8.66	6.44	5.63	4.72	4.50	8.92	4.97	3.35	4.46	3.35	3.80	4.73
8	7.93	6.08	5.37	4.56	4.66	7.46	5.23	3.34	4.12	3.49	3.76	4.79
9	7.02	5.89	5.13	4.38	5.40	7.36	4.59	3.32	3.94	4.17	3.70	4.71
10	6.59	5.76	5.01	4.25	5.82	5.99	4.69	3.29	3.89	4.35	3.69	4.61
11	[a] 8.18	5.62	4.93	4.18	5.73	6.62	4.48	3.20	3.79	4.03	3.68	4.52
12	7.52	5.47	4.84	4.38	6.06	7.16	4.26	3.22	3.67	3.81	3.66	4.34
13	7.20	5.36	4.83	5.85	6.74	7.94	4.48	3.38	3.91	3.66	3.64	4.31
14	6.90	5.28	5.59	6.22	6.28	7.64	4.71	3.42	4.29	3.52	3.62	4.22
15	6.54	5.15	5.75	5.90	5.79	7.52	4.63	3.34	4.60	3.45	3.62	4.16
16	6.07	5.47	5.45	5.57	5.40	9.04	4.47	3.72	4.21	3.39	3.62	4.14
17	6.02	8.61	5.23	5.37	5.12	9.83	4.41	3.60	3.89	3.33	3.64	4.04
18	6.10	8.85	5.04	6.54	5.08	8.60	4.63	3.34	3.61	3.30	3.57	4.03
19	8.08	8.28	4.81	6.82	5.20	7.52	5.39	3.32	3.51	3.26	3.51	4.20
20	7.42	7.48	4.61	6.74	5.10	6.38	5.56	3.38	3.49	3.23	3.42	4.39
21	7.78	6.62	4.65	7.49	5.22	5.62	5.13	3.27	3.45	3.20	3.42	4.34
22	8.62	6.74	4.61	7.94	5.50	5.35	4.66	3.40	3.43	3.30	3.47	4.32
23	7.55	7.28	4.56	8.09	5.63	5.16	4.35	3.54	3.39	3.46	3.49	4.48
24	6.89	6.87	4.47	8.05	5.50	5.04	4.27	3.43	3.33	3.66	3.48	5.05
25	6.00	6.31	4.40	7.42	5.44	4.94	3.97	3.29	3.38	3.52	3.78	5.88
26	5.63	5.82	4.32	6.76	5.41	4.66	3.90	3.26	3.49	3.44	4.52	5.63
27	5.67	5.57	4.27	6.34	5.22	4.60	3.77	3.22	3.72	3.38	4.54	5.52
28	6.08	5.91	4.20	6.38	5.04	4.79	4.27	3.15	4.11	3.54	5.36	5.26
29	5.98	.....	4.15	6.29	4.81	4.92	4.27	3.11	4.09	3.63	6.37	5.96
30	5.70	.....	4.10	5.98	4.66	4.66	4.00	3.10	4.39	3.84	5.89	10.26
31	5.50	.....	4.08	.....	4.69	.....	3.77	3.14	.....	3.72	.....	9.35

[a] Ice gorge reported by observer Jan. 11, Feb. 1 and 6, and Dec. 2.

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 to 13, Feb. 1 to 7, and Dec. 2 to 24.

ELK RIVER AT WEBSTER SPRINGS, W. VA.

This station, which is located at the suspension bridge on the grounds of the Webster Springs Hotel at Webster Springs, W. Va., was established July 1, 1908. Back Fork Creek is tributary from the right bank one-fourth mile below the station.

A vertical staff gage is fastened to the right abutment of the bridge. The gage datum has remained unchanged.

The records are reliable and accurate. Sufficient data have not yet been collected to enable estimates of the flow to be made.

The following discharge measurement was made by Bailey and Dort:

August 13, 1910: Width, 38 feet; area, 50.4 square feet; gage height, 2.00 feet; discharge, 65.8 second-feet. The measurement was not made at the regular gaging section.

Daily gage height, in feet, of Elk River at Webster Springs, W. Va., for 1910.

[Cherry Woodzell, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.55	2.62	4.35	2.26	2.72	2.85	2.40	2.32	1.70	2.22	2.18	2.92
2	3.65	2.60	3.95	2.24	2.62	3.55	2.32	2.15	2.50	2.12	2.24	2.82
3	5.30	2.70	3.68	2.24	2.52	3.42	2.28	2.02	2.32	2.02	2.36	2.72
4	4.45	3.00	3.45	2.27	2.48	3.30	2.75	2.40	2.50	1.94	2.34	2.62
5	3.90	2.92	3.25	2.45	2.42	3.95	3.10	2.48	2.62	1.88	2.25	2.52
6	3.45	2.82	3.20	2.50	2.34	4.75	2.88	2.30	2.74	1.80	2.18	2.60
7	5.10	2.80	3.25	2.52	2.30	4.50	2.88	2.12	2.75	1.80	2.12	2.52
8	3.85	2.72	3.08	2.54	2.24	3.40	3.09	2.02	2.62	1.88	2.14	2.50
9	3.35	2.78	2.88	2.51	2.60	3.10	2.89	1.98	2.50	2.14	2.06	2.48
10	3.28	3.00	2.70	2.49	2.62	3.50	2.75	1.92	2.48	2.28	2.02	2.40
11	3.22	2.80	2.62	2.44	2.58	3.90	2.55	1.89	2.35	2.20	2.00	2.40
12	3.12	2.80	2.60	2.45	4.15	3.90	2.38	1.82	2.22	2.05	2.00	2.36
13	2.95	2.84	2.58	3.11	3.84	3.90	3.10	2.05	2.80	1.95	2.00	2.28
14	3.05	2.80	2.55	2.98	3.30	3.92	3.00	1.93	2.78	1.86	1.98	2.18
15	2.85	2.82	2.50	2.90	3.01	3.72	2.90	1.82	2.55	1.82	2.00	2.10
16	2.68	3.20	2.45	2.75	2.90	6.34	2.82	1.74	2.35	1.77	2.00	2.25
17	2.60	4.35	2.45	2.70	2.75	5.18	2.72	1.68	2.29	1.76	2.00	2.18
18	3.30	4.75	2.40	2.90	2.72	4.00	2.60	1.66	2.15	1.74	1.97	2.25
19	4.55	3.95	2.40	3.00	2.75	4.25	2.51	1.66	1.99	1.71	1.95	2.70
20	4.10	3.65	2.40	2.98	2.66	3.72	2.46	1.70	1.98	1.70	1.94	3.00
21	4.30	3.35	2.42	3.15	2.66	3.80	2.32	1.69	1.97	1.68	1.92	3.00
22	4.20	4.05	2.50	3.28	2.80	3.80	2.22	1.68	1.92	1.90	1.90	2.90
23	3.50	3.80	2.44	3.60	2.82	3.40	2.12	1.69	1.82	2.32	1.88	2.90
24	3.25	3.45	2.40	4.08	2.70	2.98	2.25	1.79	1.78	2.18	1.98	3.60
25	2.95	3.25	2.39	3.85	2.70	2.88	2.25	1.78	1.96	2.02	2.25	3.48
26	3.32	3.05	2.36	3.52	2.80	2.72	1.92	1.72	2.54	1.99	2.70	2.85
27	2.80	2.85	2.31	3.25	2.72	2.60	2.10	1.66	2.68	2.05	2.69	3.05
28	2.98	3.20	2.30	3.08	2.62	2.88	2.45	1.64	2.55	2.42	2.82	2.25
29	2.90	.....	2.30	3.00	2.52	2.75	2.35	1.62	2.38	2.42	3.35	3.60
30	2.82	.....	2.30	2.85	2.58	2.58	2.55	1.68	2.31	2.28	3.05	5.50
31	2.72	.....	2.28	.....	2.70	.....	2.45	1.63	.....	2.20	.....	4.20

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 to 3, Feb. 8 to 16, and Dec. 11 to 26.

ELK RIVER AT GASSAWAY, W. VA.

This station, which is located at the Coal & Coke Railroad bridge in the northeastern part of Gassaway, W. Va., was established July 1, 1908.

Little Otter Creek enters immediately above the station.

Discharge measurements are made from a footbridge attached to the upper side of the railroad bridge or by wading. The datum of the chain gage attached to the railroad bridge has not been changed.

The records are reliable and accurate. Estimates of the flow are withheld until estimates can be made at the other stations on Elk River.

Discharge measurements of Elk River at Gassaway, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 11	A. H. Horton	142	501	3.01	698
Aug. 12	J. C. Dort	141	310	1.82	101

Daily gage height, in feet, of Elk River at Gassaway, W. Va., for 1910.

[Henry A. Hays, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.86	3.54	6.36	2.16	3.42	3.36	3.51	2.34	1.62	2.19	2.04	4.02
2	3.00	3.22	5.17	2.11	3.33	3.35	3.48	2.31	1.53	2.05	2.04	3.01
3	11.36	3.80	4.74	2.08	3.18	3.44	3.60	2.28	1.56	1.98	2.10	2.62
4	10.32	4.60	4.66	2.07	3.03	4.35	3.70	2.23	2.67	1.92	2.19	2.58
5	7.10	5.06	4.60	2.10	2.68	7.74	3.89	2.20	2.64	1.84	2.23	2.58
6	8.99	4.45	4.45	2.19	2.54	11.82	3.98	2.16	2.41	1.74	2.17	2.92
7	12.58	3.48	4.39	2.30	2.59	8.92	3.85	2.12	2.44	1.75	2.10	3.38
8	9.38	3.42	4.15	2.40	2.55	6.10	3.72	2.08	2.40	1.53	2.04	2.90
9	6.00	3.36	3.75	2.38	2.50	5.70	3.42	2.04	2.06	1.74	1.99	2.68
10	4.80	3.30	.....	2.36	2.45	5.65	3.36	2.12	1.98	1.76	1.94	2.63
11	3.94	3.47	.....	2.34	3.41	5.60	3.30	.....	1.96	2.00	1.90	2.55
12	3.41	3.54	2.82	2.37	6.23	5.66	3.24	1.80	1.94	1.85	1.93	2.42
13	3.05	3.59	2.78	3.84	9.36	5.79	3.21	1.71	2.04	1.80	1.92	2.37
14	4.52	3.76	2.72	4.02	8.05	5.46	3.16	1.75	3.94	1.78	1.90	2.32
15	5.26	3.82	2.67	4.08	6.50	7.45	3.40	1.78	2.94	1.73	1.84	2.30
16	5.84	4.00	2.64	4.12	5.79	12.10	3.66	1.72	2.51	1.66	1.82	2.28
17	5.70	8.42	2.60	4.16	4.98	19.65	3.71	1.68	2.21	1.65	1.89	2.24
18	7.54	9.80	2.54	4.24	4.90	13.50	3.63	1.62	2.10	1.62	1.88	2.24
19	11.88	7.26	2.47	4.18	4.85	10.84	3.56	1.58	1.96	1.61	1.81	2.34
20	8.06	5.38	2.41	4.04	4.80	8.10	3.49	1.52	1.92	1.59	1.78	2.75
21	7.76	4.98	2.48	4.94	4.86	5.30	3.34	1.50	1.87	1.42	1.76	2.69
22	6.65	6.53	2.50	6.30	4.94	4.80	3.04	1.47	1.88	1.63	1.74	2.60
23	5.20	6.40	2.48	6.48	4.98	4.18	2.90	1.45	1.85	1.70	1.72	2.58
24	4.90	6.00	2.46	6.54	5.04	4.00	2.55	1.44	1.78	1.66	1.72	3.73
25	4.42	5.92	2.44	6.48	4.62	3.81	2.19	1.46	1.77	1.91	1.81	3.68
26	4.12	5.82	2.42	5.89	4.10	3.74	2.16	1.50	1.83	1.87	1.79	3.61
27	3.98	5.72	2.40	5.04	3.88	3.66	2.14	1.49	1.94	1.82	1.98	3.40
28	3.86	5.62	2.38	4.11	3.64	3.62	2.12	1.48	2.40	1.86	2.44	2.99
29	3.74	.....	2.34	3.74	3.52	3.60	2.04	1.46	2.42	1.89	3.96	3.10
30	3.66	.....	2.28	3.50	3.44	3.56	2.35	1.45	2.29	1.97	4.44	8.88
31	3.61	.....	2.20	.....	3.40	.....	2.38	1.54	.....	2.12	.....	9.06

NOTE.—No ice reported by observer; relation of gage height to discharge probably not affected by ice.

ELK RIVER AT CLENDENIN, W. VA.

This station, which is located at the highway bridge in the town of Clendenin, W. Va., was established June 27, 1908.

Big Sandy River enters Elk River immediately below the station.

Discharge measurements are made from the highway bridge or by wading. The datum of the chain gage attached to the bridge has not been changed.

The records are reliable and accurate, except that high water on the Big Sandy alone may produce backwater at the gage. This will not occur often, however, as the Big Sandy is a small stream. The gage reader has been instructed to note any backwater effect. Sufficient data have not yet been collected to enable estimates of discharge to be made.

Discharge measurements of Elk River at Clendenin, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 6	C. T. Bailey	224	930	4.81	2,200
Aug. 11	J. C. Dort	125	414	2.49	188

Daily gage height, in feet, of Elk River at Clendenin, W. Va., for 1910.

[J. W. Riley, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.98	4.72	4.74	2.96	4.42	3.84	4.25	2.95	2.14	3.15	2.86	4.73
2	3.18	4.46	6.16	2.94	4.25	3.95	3.65	3.14	2.10	2.86	2.77	4.16
3	6.08	4.25	5.85	2.90	3.88	3.74	3.44	2.96	2.38	2.68	2.70	3.73
4	10.08	6.08	5.52	2.93	3.41	4.56	4.97	2.80	2.56	2.56	2.68	3.55
5	7.78	6.56	5.12	3.44	3.79	5.22	5.75	2.70	3.72	2.53	2.62	3.40
6	7.32	5.84	4.80	3.32	3.62	9.17	5.29	2.56	4.44	2.47	2.79	3.89
7	10.50	4.94	4.54	3.28	3.48	9.66	5.07	2.54	3.45	2.42	2.84	4.65
8	10.36	4.32	4.34	3.26	3.32	6.86	5.39	2.80	3.12	2.30	2.78	4.51
9	6.86	4.22	4.22	3.25	4.68	5.58	5.15	2.66	3.22	2.42	2.65	4.06
10	5.76	4.44	4.02	3.19	5.42	5.90	4.81	2.51	3.04	2.32	2.61	3.67
11	4.93	4.54	3.92	3.13	5.30	5.69	4.38	2.48	2.82	2.25	2.56	3.67
12	4.60	4.98	3.83	3.24	11.26	5.81	4.00	2.40	2.65	2.24	2.50	3.70
13	4.07	4.85	3.74	4.04	11.06	5.79	7.35	2.35	2.56	2.38	2.43	3.67
14	5.74	4.48	3.63	4.34	7.86	6.26	7.38	2.37	3.28	2.50	2.44	3.59
15	6.50	4.64	3.64	4.74	6.14	5.99	6.08	2.27	3.54	2.42	2.42	3.51
16	5.89	8.07	3.51	4.51	5.26	8.01	6.16	2.22	3.68	2.25	2.42	3.43
17	5.50	8.06	3.54	4.26	4.80	15.19	5.05	2.18	3.24	2.27	2.34	3.31
18	7.12	9.96	3.43	4.22	4.66	10.75	4.88	2.12	3.03	2.26	2.34	2.99
19	10.36	8.61	3.40	4.39	4.46	7.21	4.82	2.21	2.82	2.20	2.39	2.97
20	8.94	6.69	3.33	5.09	4.18	8.65	4.24	2.12	2.68	2.16	2.38	3.15
21	11.02	5.98	3.28	6.78	4.36	6.45	3.82	2.12	2.66	2.08	2.36	3.95
22	10.13	7.16	3.24	7.24	4.30	5.27	3.64	2.11	2.55	2.16	2.32	4.29
23	7.56	8.01	3.22	7.29	4.11	6.11	3.26	2.06	2.44	2.18	2.26	3.91
24	5.98	7.14	3.24	4.24	4.10	5.51	3.10	2.02	2.40	2.18	2.30	5.03
25	5.66	6.08	3.23	4.26	5.30	4.61	2.90	1.98	2.43	2.23	2.28	6.09
26	5.50	5.36	3.20	4.37	6.40	4.23	2.77	1.88	2.46	2.24	2.23	5.70
27	5.62	4.82	3.17	6.16	5.46	7.67	2.68	1.86	2.38	2.40	2.23	4.80
28	6.25	4.57	3.11	5.55	4.84	5.95	2.78	1.85	2.36	2.26	2.43	4.29
29	6.07	.....	3.02	5.01	4.38	4.57	2.82	1.94	2.69	2.47	3.43	3.90
30	5.42	.....	2.96	4.64	4.19	4.27	2.96	1.89	3.07	2.44	5.11	5.67
31	4.94	.....	3.00	.....	3.90	.....	3.17	1.88	.....	2.52	.....	10.07

NOTE.—No record of ice kept by observer; relation of gage height to discharge probably affected by ice about Jan. 1 to 3 and during December.

COAL RIVER AT BRUSHTON, W. VA.

This station, which is located at the Chesapeake & Ohio Railway bridge at Brushton station, near Cobbs, W. Va., was established June 23, 1908.

The drainage area above the station is about 379 square miles. Brush Creek is tributary on the left bank, about 500 feet below the station.

The datum of the chain gage attached to the railroad bridge has remained unchanged.

The records are reliable and accurate. Sufficient data have not yet been collected to enable estimates of the flow to be made.

Discharge measurements of Coal River at Brushton, W. Va., in 1910.

Date	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 4	C. T. Bailey	136	292	3.12	666
4	do	136	292	3.12	668
Aug. 9	Bailey and Dort	45	40.0	1.37	[a] 40.1

[a] Measurement made by wading and not at regular section.

Daily gage height, in feet, of Coal River at Brushton, W. Va., for 1910.

[Geo. W. Fitzpatrick, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.55	2.7	2.8	1.9	2.55	2.7	2.05	1.7	1.65	1.2	1.5	2.3
2	1.75	2.6	3.45	1.8	2.45	2.45	1.9	1.6	1.55	1.15	1.4	2.05
3	3.0	2.65	3.35	1.85	2.3	2.3	2.25	1.55	2.2	1.1	1.4	1.9
4	3.1	3.35	3.1	2.0	2.25	2.15	4.95	1.5	2.4	1.1	1.4	1.8
5	2.7	3.7	2.9	1.9	2.2	2.2	5.85	1.45	2.7	1.1	1.4	1.85
6	2.9	3.35	2.75	2.1	2.1	5.2	4.5	1.4	2.45	1.1	1.4	2.45
7	5.15	2.85	2.65	2.05	2.1	4.5	4.35	1.4	2.15	1.1	1.3	3.2
8	4.15	2.75	2.55	1.95	2.25	3.3	4.25	1.4	2.0	1.15	1.3	2.65
9	3.15	2.7	2.45	1.9	2.8	2.95	3.55	1.4	1.85	1.2	1.3	2.35
10	2.55	2.8	2.35	1.8	3.95	3.15	3.05	1.4	1.9	1.2	1.3	2.15
11	2.25	3.2	2.65	1.75	3.55	3.05	2.75	1.35	2.05	1.2	1.3	2.05
12	2.3	3.1	3.0	1.95	5.7	3.05	2.45	1.3	1.9	1.2	1.3	2.0
13	2.1	2.9	3.3	2.45	4.95	3.0	2.45	1.3	1.75	1.2	1.3	1.9
14	2.6	2.7	3.35	3.2	4.05	3.1	2.4	1.3	1.65	1.2	1.3	1.8
15	3.0	2.8	3.1	3.05	3.5	3.4	2.3	1.2	1.55	1.2	1.2	1.75
16	2.9	3.75	2.85	2.8	3.1	4.3	2.2	1.2	1.5	1.15	1.2	1.7
17	2.7	4.65	2.75	2.7	2.9	5.15	2.35	1.3	1.5	1.1	1.2	1.7
18	3.05	5.25	2.55	2.65	2.75	4.35	2.75	1.25	1.4	1.1	1.2	1.6
19	6.1	4.3	2.45	2.6	2.65	3.35	3.25	1.2	1.4	1.1	1.2	1.75
20	4.35	3.7	2.4	2.6	2.5	3.45	2.9	1.2	1.4	1.1	1.15	1.7
21	5.1	3.35	2.3	3.8	2.4	3.4	2.55	1.1	1.3	1.0	1.1	1.6
22	5.5	3.35	2.25	5.15	2.4	2.8	2.35	1.1	1.3	1.1	1.1	1.6
23	4.05	3.65	2.2	4.25	2.35	2.7	2.15	1.1	1.3	1.1	1.1	[a] 1.65
24	3.45	3.6	2.1	3.75	2.4	2.7	2.2	1.1	1.2	1.1	1.1	1.95
25	3.15	3.3	2.1	3.5	3.45	2.75	2.0	1.1	1.2	1.1	1.3	2.65
26	3.05	3.0	2.1	3.4	4.1	2.25	2.15	1.0	1.2	1.1	1.3	2.45
27	3.05	2.8	2.0	3.15	3.45	2.6	2.05	1.0	1.2	1.2	1.3	2.3
28	3.25	2.7	2.0	2.95	2.95	2.45	2.0	1.0	1.2	1.3	1.6	2.15
29	3.25	.....	1.9	2.75	2.65	2.25	1.9	0.9	1.25	1.3	2.5	2.1
30	2.9	.....	1.9	2.6	2.5	2.15	1.8	1.0	1.25	1.45	2.5	3.1
31	2.75	.....	1.9	.....	2.95	.....	1.8	1.3	.....	1.5	.....	3.8

[a] Observer reported ice 0.3 foot thick above and below gage Dec. 23; river open at gage.

COAL RIVER AT TORNADO, W. VA.

This station, which is located at the highway bridge at Upper Falls station, one-fourth mile above Tornado, W. Va., was established June 24, 1908.

Smith Creek is tributary on the right bank, about 1 mile below the station.

The datum of the chain gage attached to the bridge has not been changed.

The records are reliable and accurate. The low-water gage heights may be affected by a dam a short distance below the station.

Sufficient data have not been collected to enable estimates of the discharge to be made.

Discharge measurements of Coal River at Tornado, W. Va., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 3	C. T. Bailey	185	996	3.42	1,460
3	do	185	996	3.43	1,450
Aug. 8	Bailey and Dort	90	92	2.26	[a] 115

[a] Measurement made by wading and not at regular section.

Daily gage height, in feet, of Coal River at Tornado, W. Va., for 1910.

[G. C. Hoy, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.64	3.02	3.19	2.42	2.82	2.89	2.62	2.45	2.78	2.42	2.92	3.30
2	2.84	2.97	3.32	2.36	2.74	2.76	2.46	2.33	2.86	2.50	2.93	3.08
3	3.18	2.99	3.39	2.40	2.59	2.63	2.34	2.34	3.10	2.52	2.88	2.96
4	3.54	3.25	3.34	2.46	2.59	2.49	2.88	2.43	3.49	2.66	3.00	2.92
5	3.51	3.58	3.21	2.52	2.57	2.46	8.74	2.30	3.59	2.67	2.90	2.91
6	3.81	3.57	3.12	2.54	2.44	4.09	4.96	2.15	3.18	2.68	2.88	3.30
7	4.98	3.24	3.01	2.53	2.27	4.29	4.28	2.16	2.88	2.64	2.82	3.85
8	4.43	3.16	2.93	2.45	2.60	3.66	4.16	2.15	2.90	2.82	2.82	3.64
9	3.58	3.06	2.83	2.40	3.18	3.53	3.71	2.24	2.85	2.95	2.89	3.00
10	3.00	3.04	2.75	2.36	4.02	3.93	3.25	2.25	2.80	2.70	2.86	3.00
11	3.34	3.15	2.92	2.25	3.68	3.89	3.00	2.51	2.78	2.66	2.90	2.85
12	2.84	3.22	3.17	2.44	6.56	3.93	2.71	2.51	2.64	2.70	2.84	2.72
13	2.84	3.19	3.46	3.05	6.48	3.49	2.76	2.42	2.47	2.70	2.82	2.60
14	3.47	3.23	3.49	3.36	4.44	3.38	2.80	2.34	2.30	2.70	2.81	2.26
15	3.53	3.44	3.35	3.40	3.70	3.53	2.59	2.32	2.24	2.71	2.80	2.23
16	3.41	4.12	3.15	3.30	3.40	3.87	2.40	2.34	2.12	2.66	2.78	2.35
17	3.26	5.22	3.03	3.22	3.20	4.49	3.06	2.35	2.10	2.67	2.68	2.15
18	3.68	5.76	2.92	3.26	3.09	4.27	3.47	2.48	2.00	2.68	2.70	2.30
19	5.41	4.70	2.83	3.32	2.96	3.67	3.94	2.47	2.00	2.65	2.69	2.55
20	4.91	3.89	2.67	3.37	2.86	3.68	3.39	2.30	1.96	2.62	2.62	2.60
21	4.65	3.66	2.65	4.15	2.88	3.61	2.99	1.98	1.95	2.64	2.68	2.50
22	6.21	3.90	2.60	5.85	2.78	3.22	2.69	2.05	1.90	2.67	2.66	2.58
23	4.25	3.84	2.52	4.43	2.64	3.04	2.45	2.30	1.95	2.90	2.75	2.61
24	3.68	3.84	2.51	3.82	2.79	3.88	2.30	2.33	1.88	2.65	2.79	2.67
25	3.47	3.65	2.44	3.58	3.26	3.30	2.25	2.45	2.06	2.64	2.82	3.10
26	3.34	3.36	2.42	3.45	4.08	3.02	2.49	2.38	2.15	2.70	2.80	3.40
27	3.29	3.20	2.36	3.22	3.57	9.88	2.77	2.46	1.95	2.82	2.90	3.30
28	3.34	3.08	2.32	3.14	3.26	3.90	2.75	2.40	1.90	2.77	3.05	3.10
29	3.41	.....	2.45	3.02	2.97	3.18	2.75	2.46	1.88	2.82	3.28	3.08
30	3.23	.....	2.51	2.92	2.81	2.88	2.55	2.43	2.29	2.90	3.55	3.80
31	3.09	.....	2.48	.....	2.94	.....	2.45	2.43	.....	2.90	.....	4.42

NOTE.—Relation of gage height to discharge affected by ice, Jan. 1 to 5 and Dec. 18 to 28.

POCOTALIGO RIVER AT SISSONVILLE, W. VA.

This station which is located at the highway bridge near the post office at Sissonville, W. Va., was established June 26, 1908.

A dam and small power plant above the station may modify the flow in low water. The datum of the chain gage attached to the bridge has not been changed.

The records are reliable and accurate. Sufficient data have not been collected to enable estimates of the flow to be made.

The following discharge measurement was made by Bailey and Dort:

August 10, 1910: Width, 22 feet; area, 13.3 square feet; gage height, 1.87 feet; discharge, 15.0 second-feet. The measurement was not made at the regular gaging section.

Daily gage height, in feet, of Pocotaligo River at Sissonville, W. Va., for 1910.

[B. N. Sisson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.25	2.90	4.85	1.28	2.60	2.47	3.32	2.03	2.95	1.73	1.83	2.52
2	3.28	2.72	4.18	1.43	2.39	2.33	3.04	1.89	2.42	1.72	1.82	2.30
3	5.63	2.94	3.56	1.34	2.31	2.38	2.81	1.92	3.26	1.70	1.82	2.18
4	4.90	4.50	3.22	1.33	2.25	2.25	4.70	2.17	3.60	1.69	1.82	2.17
5	3.58	3.98	2.95	1.88	2.03	6.52	4.91	1.81	4.75	1.70	1.78	2.20
6	9.30	3.35	2.82	2.03	2.18	10.75	3.92	2.03	4.14	1.70	1.74	2.72
7	9.65	3.10	2.78	1.58	1.98	4.59	4.93	1.77	2.99	1.72	1.76	3.08
8	3.98	2.75	2.60	1.78	3.02	3.42	8.67	1.90	2.50	1.72	1.80	2.99
9	3.66	2.66	2.50	1.54	7.36	3.67	4.37	1.79	2.69	1.70	1.78	2.60
10	3.30	2.72	2.58	1.53	4.43	6.25	3.52	1.77	2.65	1.68	1.76	2.56
11	3.38	2.78	2.56	1.63	3.40	4.97	3.33	1.98	2.28	1.66	1.72	2.55
12	2.75	2.80	2.35	1.93	11.78	5.19	3.17	1.92	2.40	1.68	1.76	2.49
13	2.65	2.72	2.32	2.60	5.88	3.75	6.03	2.25	4.00	1.66	1.80	2.64
14	13.35	2.69	2.25	2.38	3.83	3.25	4.02	1.80	3.05	1.62	1.77	2.52
15	5.82	3.10	2.05	2.40	3.18	2.92	3.31	1.85	2.78	1.70	1.76	2.45
16	3.92	11.25	1.60	2.32	2.88	3.82	3.04	1.82	2.49	1.68	1.76	2.30
17	3.63	8.60	1.49	2.40	3.16	4.35	2.94	1.76	2.36	1.76	1.70	2.18
18	12.85	6.60	1.85	2.74	2.87	3.32	2.75	1.82	2.18	1.70	1.72	2.11
19	10.40	4.00	1.78	4.63	2.88	4.19	2.65	1.74	1.95	1.74	1.71	2.16
20	4.65	4.06	1.84	5.18	2.67	3.29	2.51	1.72	1.88	1.80	1.72	2.21
21	6.65	5.68	1.82	8.18	7.61	2.97	2.17	1.72	2.05	1.78	1.72	2.14
22	7.24	11.20	1.84	4.93	6.46	2.49	2.25	1.76	2.02	1.82	1.70	2.15
23	4.40	6.61	1.95	3.73	3.84	2.31	2.02	1.72	1.76	1.77	1.71	2.24
24	3.92	4.14	1.65	3.22	3.98	2.07	2.07	1.72	2.15	1.78	1.70	5.12
25	3.79	3.42	1.73	2.99	8.08	1.94	2.09	1.70	1.82	1.74	1.72	4.11
26	3.82	3.15	1.55	3.43	5.08	1.83	1.92	1.65	1.78	1.76	1.72	3.35
27	5.42	3.02	1.43	3.63	3.60	25.50	2.02	1.66	1.76	1.78	1.70	2.92
28	4.20	3.54	1.42	3.18	3.10	11.35	1.82	1.66	1.71	1.82	1.81	2.85
29	3.72	.....	1.46	3.93	2.73	4.65	1.87	1.72	1.70	1.82	2.55	3.12
30	3.12	.....	1.55	2.73	2.70	3.72	2.05	1.73	1.72	1.78	2.36	8.05
31	2.92	.....	1.40	.....	2.50	.....	2.41	1.67	.....	1.84	.....	4.90

NOTE.—No ice reported by observer; relation of gage height to discharge probably affected by ice during December.

MIAMI RIVER BASIN.

GENERAL FEATURES.

The drainage basin of Miami River lies in southwestern Ohio and southeastern Indiana, one-third of the area being in the latter State. The river is formed in Logan County by small streams rising in Auglaize and Hardin counties, Ohio, flows in a slight southwesterly direction and joins Ohio River at the Indiana State line. Stillwater River from the west and Mad River from the east, both tributary near Dayton, are the only important tributaries in the upper part of the basin. Whitewater River is tributary from the west a few miles above the mouth of the river. Nearly all of the drainage area of the Whitewater is in Indiana. The length of the Miami is about 140 miles (map measurement), and its drainage area comprises about 5,400 square miles.

The drainage basin is fairly regular in shape. The valleys of the headwaters as far down as Dayton are narrow and comparatively shallow. Below Dayton the valley is broad and open and is flanked by low hills. Along this section the river occupies the preglacial drainage lines which are only partially filled with glacial deposits. The contrast between the southern and northern portion of the drainage basin is due not to the work of the present streams, but to the less complete concealment of preglacial drainage lines. The surface of the surrounding country is level or rolling.

The elevation of the sources of the river is about 1,000 feet; at Dayton the elevation is about 725 feet; at Hamilton it is about 565 feet; at the mouth of the river the elevation is 428 feet. The average fall of the river is 3 to 4 feet per mile.

There are no forested areas in this drainage basin, what timber there is being in small groves or wood lots. The mean annual rainfall is about 42 inches. The winters are comparatively mild in the northern part of the basin. The snowfall is not heavy and ice does not form very thick. In the southern part the winters are mild and snowfall is light, but ice forms to some extent where the current is sluggish.

The basin affords a few opportunities for storage. Lewistown and Loramie reservoirs, near the headwaters of the Miami, are used to supply water for the Miami & Erie Canal. These reservoirs were constructed about 1830; construction of reservoirs at the present time would be prohibited by the cost of the overflowed land. It is probable that other sites might be found at the headwaters of the tributaries.

The high average slope is favorable to the development of water power, but the bed and banks of the stream are not as a rule suitable

for the foundation of dams, as they are generally composed of gravel and alluvial soil, and the banks are low. These conditions are met by building low dams to divert the water into canals. The gravelly and sandy soil is favorable for the formation of springs, of which there are a great many in the basin. These springs tend to keep up the flow during dry spells and increase the value of the stream for water power. At different places water is diverted from the river to feed the Miami & Erie Canal, which parallels the river from Hamilton to Piqua and thence along Loramie River, crossing the divide at its sources. Numerous power plants situated along this canal have leased water rights from the State.

MIAMI RIVER AT HAMILTON, OHIO.

This station is located at High Street Bridge at Hamilton, Ohio. A gage was established at this point November 16, 1904, as a flood station, by the United States Weather Bureau. On March 1, 1910, a low-water gage was installed by the United States Geological Survey. Both gages are of the vertical staff type and both are referred to the same datum plane so that there is now, in reality, only one gage in two sections. Records of flood stages are available from November 16, 1904, to February 27, 1910, and records of daily gage height from February 28 to December 31, 1910.

The total drainage area above the gaging station is 3,580 square miles.

Discharge measurements are made from the upstream side of High Street Bridge. The records are reliable and accurate.

Discharge measurements of Miami River at Hamilton, Ohio, in 1908–1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1908.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 22	A. H. Horton	316	1,352	0.75	401
22	do	117	206	.75	[a] 287
23	do	178	229	.83	[b] 279
23	do	117	217	.83	[a] 284
1909.					
Feb. 26	do	360	3,730	7.82	19,400
1910.					
Feb. 4	A. H. Horton and assistants	325	2,020	2.92	3,840
4	do	325	2,050	2.98	4,080
Mar. 1	Horton and Bailey	425	7,900	17.38	66,500
2	do	425	6,540	14.22	48,300
3	A. H. Horton	382	4,510	9.25	26,800

[a] Measurement made at lower bridge.
[b] Measurement made by wading between bridges.

Daily gage height, in feet, of Miami River at Hamilton, Ohio, for 1910.

[C. A. Huber, observer. See note.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	(a)	.....	17.20	2.15	2.00	1.90	1.35	1.35	0.75	1.65	2.00	2.45
2	4.5	.....	13.25	2.11	1.95	1.80	1.28	1.30	.75	1.30	2.00	2.40
3	4.0	.....	8.90	2.12	1.98	1.80	1.20	1.28	1.70	1.40	2.00	2.30
4	(a)	2.9	6.80	2.10	2.80	1.78	1.20	1.22	1.40	1.30	2.00	2.30
5	(a)	.....	5.95	2.12	3.08	1.72	1.20	1.20	1.30	3.40	2.00	2.28
6	(a)	.....	5.45	2.15	2.60	1.70	1.75	1.15	1.50	13.55	2.00	2.20
7	(a)	.....	4.92	2.15	2.40	1.65	1.65	1.00	2.50	14.40	2.00	2.10
8	(a)	.....	4.45	2.15	2.50	1.65	1.70	1.00	2.00	13.95	2.00	2.00
9	(a)	.....	4.05	2.15	2.38	1.65	1.65	1.08	1.75	8.30	2.00	2.00
10	(a)	.....	3.70	2.12	2.25	1.65	1.80	1.00	1.80	5.95	2.00	2.00
11	(a)	.....	3.45	2.00	2.20	1.65	2.08	1.00	1.55	4.75	2.00	2.00
12	4.0	.....	3.25	1.95	2.30	1.65	2.02	.90	1.45	4.08	2.00	2.00
13	4.5	.....	3.10	1.90	2.45	1.65	2.18	.90	1.95	3.70	2.00	2.00
14	10.8	.....	3.00	1.90	2.32	1.60	1.90	.90	2.15	3.30	2.00	2.00
15	8.4	.....	3.00	1.90	2.20	1.58	1.80	.90	2.10	3.00	2.00	2.00
16	5.1	4.5	2.80	1.90	2.18	1.55	3.15	.90	1.85	2.85	2.00	2.00
17	4.2	5.5	2.78	1.85	2.00	1.50	2.42	.90	1.65	2.70	2.00	2.00
18	11.0	5.0	2.80	1.95	2.02	1.45	2.12	.90	1.45	2.62	2.00	2.00
19	11.6	.....	2.68	1.95	1.92	1.35	1.80	.85	1.40	2.52	2.00	2.00
20	9.0	.....	2.62	2.00	2.32	1.35	1.65	.85	1.55	2.48	2.00	2.00
21	6.9	.....	2.50	2.35	2.75	1.40	1.60	.80	1.40	2.45	2.00	2.00
22	5.6	.....	2.45	3.10	3.20	1.32	1.50	.80	1.35	2.40	2.00	2.00
23	4.8	.....	2.40	2.70	2.75	1.30	1.42	.95	1.30	2.38	2.00	2.00
24	3.7	.....	2.38	2.35	2.48	1.30	1.32	.80	1.25	2.28	2.00	2.00
25	3.5	.....	2.32	2.20	2.38	1.30	1.25	.80	1.18	2.25	2.00	2.00
26	3.2	4.0	2.30	2.15	2.32	1.30	1.20	.80	1.15	2.20	2.00	2.00
27	3.5	5.7	2.26	2.10	2.18	1.35	1.20	.75	1.35	2.15	2.10	2.00
28	3.3	15.40	2.21	2.05	2.02	1.35	1.42	.75	1.60	2.10	2.00	2.20
29	3.0	.....	2.20	2.05	2.00	1.40	1.50	.75	2.00	2.05	2.00	4.00
30	3.0	.....	2.20	2.02	1.90	1.40	1.50	.75	1.88	2.00	2.50	5.65
31	3.0	.....	2.15	.....	1.90	.....	1.40	.75	.....	2.00	.....	4.90

[a] River reported "frozen" Jan. 1 and Jan. 4 to 11.

NOTE.—Record of gage heights obtained as follows: Jan. 1 to 31 and Feb. 16 to 27, furnished by United States Weather Bureau; Feb. 4, from discharge measurement made by A. H. Horton; Feb. 28 to Dec. 31, by United States Geological Survey, C. A. Huber, observer. No ice reported by observer from Feb. 28 to Dec. 31. Relation of gage height to discharge probably affected by ice Jan. 12, 13, 30, 31, Feb. 26 and 27, and in December.

Daily gage height, in feet, and discharge, in second-feet, of Miami River at Hamilton, Ohio, for 1907–1909.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1907.			1908.			1909.		
Jan. 4	14.5	50,400	Feb. 16	15.3	54,500	May 9	6.5	15,600
5	9.3	26,400	17	11.4	35,600	10	9.5	27,300
6	7.0	17,400	Mar. 3	14.0	47,900	11	9.2	26,000
20	13.4	45,000	6	10.5	31,600	12	8.0	21,200
21	12.0	38,400	7	13.9	47,400	13	6.5	15,600
Mar. 13	14.5	50,400	8	8.5	23,200	26	4.0	7,160
14	20.0	80,500	19	8.9	24,800	27	7.0	17,400
15	16.3	59,800	May 7	12.0	38,400	28	6.5	15,600
1908.			1909.			June 25	3.5	5,630
Feb. 14	10.0	29,400	Feb. 22	5.0	10,400	26	8.5	23,200
15	17.0	63,700	26	8.9	24,800	27	6.5	15,600
						28	4.0	7,160

Daily discharge, in second-feet, of Miami River at Hamilton, Ohio, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5,000	3,000	64,800	1,990	1,660	1,450	655	655	270	995	1,660	2,680
2	8,760	2,800	44,300	1,900	1,560	1,250	594	610	270	610	1,660	2,560
3	7,160	2,800	24,800	1,920	1,620	1,250	530	594	1,070	700	1,600	2,330
4	6,300	3,860	16,800	1,880	3,580	1,210	530	546	700	610	1,660	2,330
5	5,700	5,600	13,600	1,920	4,380	1,110	530	530	610	5,330	1,660	2,280
6	5,000	4,800	11,900	1,990	3,050	1,070	1,160	495	800	45,700	1,660	2,100
7	4,000	4,000	10,100	1,990	2,560	995	995	400	2,800	49,900	1,660	1,880
8	3,000	3,200	8,600	1,990	2,800	995	1,070	400	1,660	47,700	1,660	1,660
9	2,500	2,600	7,320	1,990	2,510	995	995	448	1,160	22,400	1,660	1,660
10	2,000	2,300	6,230	1,920	2,220	995	1,250	400	1,250	13,600	1,660	1,660
11	3,000	2,000	5,480	1,660	2,100	995	1,840	400	860	9,580	1,660	1,660
12	5,000	1,800	4,880	1,560	2,330	995	1,700	340	750	7,420	1,660	1,660
13	7,000	2,200	4,440	1,450	2,680	995	2,060	340	1,560	6,230	1,660	1,660
14	32,900	2,000	4,150	1,450	2,380	920	1,450	340	1,990	5,030	1,660	1,660
15	22,800	1,800	4,150	1,450	2,100	896	1,250	340	1,880	4,150	1,660	1,660
16	10,700	8,760	3,580	1,450	2,060	860	4,580	340	1,350	3,720	1,660	1,660
17	7,800	12,100	3,530	1,350	1,660	800	2,610	340	995	3,310	1,660	1,660
18	33,800	10,400	3,580	1,560	1,700	750	1,920	340	750	3,100	1,660	1,660
19	36,500	9,000	3,260	1,560	1,490	655	1,250	315	700	2,850	1,660	1,660
20	25,200	7,000	3,100	1,660	2,380	655	995	315	860	2,750	1,660	1,660
21	17,000	5,000	2,800	2,440	3,440	700	920	290	700	2,680	1,660	1,660
22	12,400	4,500	2,680	4,440	4,730	628	800	290	655	2,560	1,660	1,660
23	9,740	4,000	2,560	3,310	3,440	610	720	370	610	2,510	1,660	1,660
24	6,230	3,500	2,510	2,440	2,750	610	628	290	570	2,280	1,660	1,660
25	5,630	3,000	2,380	2,100	2,510	610	570	290	516	2,220	1,660	1,660
26	4,730	3,000	2,330	1,990	2,380	610	530	290	495	2,100	1,660	1,660
27	5,630	7,000	2,240	1,880	2,060	655	530	270	655	1,990	1,880	1,660
28	5,030	55,000	2,120	1,770	1,700	655	720	270	920	1,880	1,660	2,100
29	4,150	.....	2,100	1,770	1,660	700	800	270	1,660	1,770	1,660	7,160
30	3,600	.....	2,100	1,700	1,450	700	800	270	1,410	1,660	2,800	12,600
31	3,200	.....	1,990	.....	1,450	.....	700	270	.....	1,660	.....	10,100

NOTE.—Daily discharge determined by means of a discharge rating curve that is well defined between 250 and 66,500 second-feet (gage heights 0.7 and 17.5 feet); and is a tangent above 62,600 second-feet (gage height 16.8 feet), and extended as such above 66,500 second-feet (gage height 17.5 feet).

Daily discharge Jan. 1, 4 to 13, Jan. 30 to Feb. 3, Feb. 5 to 15, and Feb. 19 to 27 estimated, because of ice and absence of gage heights, from record of discharge at Dayton, Ohio, and climatologic records.

Daily discharge (1,660 second-feet) Nov. 1 to 26 and Dec. 9 to 29 probably too high. From a study of the gage height record on Miami River at Dayton, Ohio, kept by the United States Weather Bureau, and the United States Geological Survey discharge rating table for 1906 for Miami River at Dayton, Ohio, it appears that the mean discharge at Hamilton from Nov. 1 to 26 should be about 1,120 second-feet (ranging from about 850 to 1,600 second-feet), and from Dec. 9 to 27 about 860 second-feet (ranging from about 550 to about 1,600 second-feet).

Monthly discharge of Miami River at Hamilton, Ohio, for 1910.

[Drainage area, 3,580 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	36,500	*a* 2,000	10,000	2.79	3.22	C.
February	55,000	*a* 1,800	6,320	1.77	1.84	D.
March	64,800	1,990	8,850	2.47	2.85	A.
April	4,440	1,350	1,950	.545	.61	B.
May	4,730	1,450	2,400	.670	.77	B.
June	1,450	610	877	.245	.27	B.
July	4,580	530	1,150	.321	.37	B.
August	655	270	376	.105	.12	C.
September	2,800	270	1,020	.285	.32	B.
October	49,900	610	8,350	2.33	2.69	B.
November	2,800	*b* 1,660	*b* 1,710	.478	.53	D.
December	12,600	*b* 1,660	*b* 2,620	.732	.84	D.
The year	64,800	270	3,810	1.06	14.43	

a Estimated. *b* Probably too high; see footnote to table of daily discharge.

NOTE.—See footnote to table of daily discharge relative to periods of estimated discharge.

KENTUCKY RIVER BASIN.

DIX RIVER NEAR BURGIN, KY.

Kentucky River joins the Ohio from the south about halfway between Cincinnati, Ohio, and Louisville, Ky.

Dix River, the only tributary on which a gaging station is now maintained, rises in the southern part of Garrard County, flows westward into Lincoln County, then, in general, northward to its junction with Kentucky River at High Bridge. For much of its course it forms the boundary between Garrard County on the east and Boyle and Mercer counties on the west. The drainage area comprises 436 square miles.

The gaging station, which is located at the highway bridge on the Burgin-Buena Vista pike, about 4 miles from Burgin, Ky., was established by representatives of the Kentucky Geological Survey and the Madison Electric & Power Co., of Richmond, Ky. The station has not been inspected by engineers of the United States Geological Survey.

The drainage area above the station is 416 square miles.

The gage is a staff attached to an abutment of the highway bridge. The gage heights and discharge measurements are furnished by the Kentucky Geological Survey and the Madison Electric & Power Co. The computations of daily and monthly discharge were made by the United States Geological Survey.

The discharge rating curve is fairly well defined. The record is considered reliable and accurate.

Discharge measurements of Dix River near Burgin, Ky., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 18	A. F. Foerste	141	898	7.65	1,650
19	G. T. Bogard	141	715	6.44	966
20	.....do	141	607	5.64	653
20	.....do	141	574	5.44	600
21	.....do	141	519	5.1	454
Aug. 14	A. F. Foerste	.....	.....	3.3	[a] 50.4
25	G. T. Bogard	143	372	4.3	219
Sept. 2	L. B. Herrington	142	1,610	12.35	6,260
20	.....do	142	1,280	10.2	3,870

[a] Large cross section of dead water not measured.

NOTE.—These measurements were not made by the engineeers of the United States Geological Survey. Measurements computed at Newport office from copies of original notes.

Daily gage height, in feet, of Dix River near Burgin, Ky., for 1910.

[C. P. Kennedy, observer.]

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.05	7.70	5.25	3.70	6.05	16	9.00	3.28	3.88	4.60	3.20	4.80
2	3.90	4.50	10.35	4.90	3.80	5.70	17	11.15	3.28	3.75	4.35	3.30	4.60
3	3.80	4.20	8.45	4.45	3.70	5.30	18	7.82	3.30	3.70	4.05	3.35	4.60
4	5.85	4.00	8.10	4.12	.....	5.05	19	6.00	3.28	8.80	4.00	3.35	4.60
5	5.30	4.00	11.05	4.00	.....	5.00	20	5.35	3.70	11.50	3.85	3.30	4.55
6	8.30	3.80	10.00	4.20	.....	7.85	21	5.00	4.60	7.55	3.80	3.00	4.55
7	7.50	3.80	8.25	5.35	.....	7.45	22	4.65	9.05	6.40	3.90	3.00	4.50
8	9.00	3.80	6.05	8.75	3.40	6.45	23	4.50	5.60	5.90	4.05	3.15	4.55
9	6.80	3.60	5.55	6.65	3.45	5.80	24	4.30	5.05	6.05	4.25	3.10	4.75
10	5.70	3.60	5.00	5.75	3.50	5.70	25	4.10	4.45	6.55	4.10	3.15	4.85
11	5.30	3.60	4.75	5.30	3.40	6.00	26	3.95	5.20	10.65	3.95	3.15	4.80
12	5.10	3.40	4.55	5.05	3.50	6.00	27	3.90	5.05	7.45	3.90	3.55	5.05
13	5.00	3.30	4.65	4.90	3.50	5.60	28	4.15	6.50	6.45	3.80	9.00	5.30
14	6.90	3.30	4.30	4.75	3.35	5.00	29	5.10	5.50	5.85	3.70	9.15	5.75
15	6.50	3.30	4.05	4.65	3.20	4.80	30	6.25	5.15	5.50	3.80	6.45	12.55
							31	6.50	4.90	.....	3.75	.....	9.90

NOTE.—Relation of gage height to discharge probably affected by ice about December 10 to 27.

Daily discharge, in second-feet, of Dix River near Burgin, Ky., for 1910.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	436	1.730	502	99	808	16	2.760	48	129	298	41	.....
2	132	270	4.050	388	115	665	17	4.880	48	107	232	50	.....
3	115	195	2.300	257	99	519	18	1,820	50	99	162	55	.....
4	724	151	2.020	177	92	436	19	786	48	2.580	151	55	.....
5	519	151	4.770	151	84	420	20	536	99	5,240	124	50	.....
6	2.180	115	3.700	195	76	1.840	21	420	298	1,630	115	26	.....
7	1.600	115	2.140	536	68	1.570	22	312	2.800	978	132	26	.....
8	2.760	115	808	2.540	60	1.000	23	270	627	744	162	37	.....
9	1.190	84	608	1.110	66	704	24	219	436	808	207	33	.....
10	665	84	420	684	71	.....	25	172	257	1,060	172	37	.....
11	519	84	342	519	60	.....	26	142	485	4,350	142	37	.....
12	452	60	284	436	71	.....	27	132	436	1.570	132	78	.....
13	420	50	312	388	71	.....	28	184	1.030	1.000	115	2.760	519
14	1.240	50	219	342	55	.....	29	452	590	724	99	2.900	684
15	1.030	50	162	312	41	.....	30	902	468	590	115	1.000	6.380
							31	1.030	388	.....	107	.....	3.600

NOTE.—Daily discharge determined by means of a discharge rating curve fairly well defined between 50 and 6,550 second-feet (gage heights 0.3 and 12.7 feet). Discharge interpolated Nov. 4 to 7. Discharge Dec. 10 to 27 estimated, because of ice, from climatologic records; mean discharge 314 second-feet, estimated values varying from 150 to 600 second-feet.

Monthly discharge of Dix River near Burgin, Ky., for 1910.

[Drainage area, 416 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
July 2-31	4,880	115	952	2.29	2.56	A.
August	2,800	48	326	.784	.90	A.
September	5,240	99	1,520	3.66	4.08	A.
October	2,540	99	355	.853	.97	A.
November	2,900	26	277	.666	.74	B.
December	6,380	.....	800	1.92	2.21	C.

NOTE.—See footnotes to tables of daily gage height and daily discharge.

WABASH RIVER BASIN.

GENERAL FEATURES.

The drainage area of Wabash River lies in Ohio, Illinois, and Indiana, slightly more than two-thirds of the area being in the last-named State.

The Wabash rises in the southwestern part of Mercer County, Ohio, flows northwestward across the Indiana State line to Huntington in Huntington County, and thence slightly southwestward to Logansport in Cass County. At Logansport the river turns more to the southwest until it reaches Covington, in Fountain County, where it finally turns south, continuing in this direction to Terre Haute, below which its course is slightly southwestward to its junction with Ohio River about 30 miles below Mount Vernon, Ind. From a point about 15 miles below Terre Haute to the mouth it forms the boundary line between Indiana and Illinois.

The important tributaries, beginning at the sources and following down the left bank, are Salamonie and Mississinewa rivers, Wild Cat, Sugar, and Raccoon creeks, and White and Patoka rivers; on the right bank are Little, Eel, Tippecanoe, Vermilion, Embarrass, Little Wabash, and Saline rivers. White River is much the largest tributary. The length of the Wabash is about 410 miles (map measurement), and its drainage area comprises approximately 33,000 square miles.

The basin is regular in shape. Only a small part of the entire drainage area lies outside the glaciated region. The Wabash and the West Branch of the White lie within that area for their entire length. The East Branch of the White leaves the glaciated area in the lower part of its course, and enters it again about 20 miles above its mouth.

All the rock formations are more or less covered with glacial drift in the form of sand and gravel ridges and till plains. In general the surface of the country is flat, with a general slope toward the southwest. In the unglaciated section in southern Indiana the country is more uneven. Rock outcrops at many places in the bed of the main stream and its tributaries.

Along Little Wabash River, which enters the Wabash about 15 miles above its mouth, drainage and flood control are subjects of considerable interest. The Department of Agriculture is making a study of conditions with a view to developing a plan for reclaiming and protecting areas that are overflowed during floods. Portions of the river have already been mapped for use in this study.

The elevation of the sources of Wabash River is about 1,000 feet; at Huntington the elevation is 699 feet; at Logansport it is 583 feet;

at Terre Haute, 478 feet; at the mouth of White River, 376 feet; at the mouth, 311 feet.

The basin is thickly settled and highly cultivated, and the timber standing comprises only groves and woodlots, generally of small extent.

The mean annual rainfall is about 40 inches. The winters in the northern part of the basin are comparatively severe. The snowfall is not heavy, but ice forms on the streams about 1 foot in thickness; in the lower part of the basin the winters are mild and ice does not form very thick.

The high value of farm land in this section would undoubtedly prohibit the construction of reservoirs for storage.

The main stream and its tributaries afford good opportunities for water power, especially the East and West branches of the White, where the fall is much more than on the Wabash. In general, the water power is not being developed.

At the headwaters of Wabash River, in Mercer County, Ohio, is a large reservoir, called Grand Reservoir, that is used to store water which is supplied to the Miami & Erie Canal. This reservoir receives the drainage from about 200 square miles, and its capacity is about 4,000,000,000 cubic feet. The water that is thus fed to the canal is diverted from the basin of the Wabash River.

The Wabash is navigable for part of its length.

WABASH RIVER AT MOUNT CARMEL, ILL.

This station, which is located at the Southern Railway bridge at Mount Carmel, Ill., was established June 16, 1884. The original gage belonged to the United States Engineer Corps, but it was rebuilt in November, 1904, by the United States Weather Bureau, which furnishes the gage readings. It is a staff gage attached to the first round pier from the west side of the railway bridge. On October 10, 1908, the United States Geological Survey began taking discharge measurements.

White River enters 1½ miles above the station and Patoka River enters immediately above the station. Measurements of extreme floods may be difficult to obtain on account of the many overflow channels east of the station.

Winters in this locality are mild. Ice does not form very thick and rarely lasts a month at a time.

The datum of the gage has probably remained unchanged since it was established in 1884.

Sufficient data have not yet been collected to enable estimates of discharge to be made.

Discharge measurements of Wabash River at Mount Carmel, Ill., in 1908–1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1908.					
Oct. 10	O'Neill and Chapman	772	5,400	1.15	2,620
1909.					
Mar. 9	W. M. O'Neill	1,440	19,200	13.92	53,600
Apr. 30	Jackson and Chapman	1,210	13,400	9.18	35,200
May 24	do	979	9,910	6.33	21,300
1910.					
Jan. 29	H. J. Jackson	1,970	28,200	18.86	77,100
Mar. 23	M. E. McChristie	975	8,870	5.40	16,700
Nov. 11	C. T. Bailey	813	6,620	2.50	7,060

Daily gage height, in feet, of Wabash River at Mount Carmel, Ill., for 1910.

[H. M. Phillips, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	13.8	16.1	4.3	5.5	4.9	3.7	7.8	1.8	1.8	3.2	6.4
2	5.0	11.0	17.3	4.2	5.4	4.7	3.9	6.5	1.7	1.8	3.1	5.9
3	5.0	9.9	18.1	4.0	5.5	4.3	3.2	5.7	1.7	1.7	3.0	5.3
4	.....	8.6	18.8	3.9	5.8	4.1	3.3	4.9	2.5	2.0	2.9	5.3
5	.....	7.6	19.4	3.8	7.1	3.9	3.8	4.2	3.6	4.4	2.8	5.2
6	.....	7.5	20.2	3.8	7.3	3.8	4.5	4.0	5.2	10.5	2.8	5.0
7	.....	7.4	21.1	3.7	7.4	3.7	4.8	3.6	5.6	15.2	2.8	4.5
8	.....	7.1	21.7	3.7	7.6	3.6	5.1	3.2	6.6	16.2	2.7	4.0
9	11.4	7.3	21.9	3.6	7.7	3.5	4.8	2.8	8.2	15.9	2.7	3.6
10	.....	7.0	21.7	3.6	7.7	3.3	4.4	2.6	7.2	16.0	2.6	3.3
11	.....	6.4	21.0	3.6	7.6	3.2	5.1	2.5	7.1	16.2	2.6	3.1
12	.....	6.0	19.1	3.6	7.5	3.0	4.9	2.4	6.7	16.9	2.5	3.0
13	.....	5.5	15.5	3.6	7.7	2.9	4.9	2.3	5.8	17.4	2.5	3.0
14	11.9	5.2	12.1	3.6	7.9	2.8	5.5	2.2	5.0	17.7	2.4	2.9
15	11.8	5.0	9.7	3.6	7.6	2.8	5.5	2.1	4.6	17.5	2.4	2.7
16	13.2	4.8	8.5	3.6	7.1	2.8	5.2	2.0	4.2	17.1	2.3	2.5
17	13.8	4.8	6.8	4.1	6.2	2.7	7.7	2.0	4.0	16.2	2.2	2.4
18	15.8	4.8	6.2	5.0	5.6	2.6	12.1	1.9	3.6	14.4	2.2	2.4
19	17.1	.....	6.0	5.7	5.1	2.5	12.8	1.9	3.2	10.7	2.2	2.4
20	17.7	5.0	6.0	6.2	4.8	2.4	12.5	1.9	3.0	7.7	2.1	2.3
21	18.3	5.3	5.9	6.8	4.7	2.3	12.3	1.9	2.8	6.5	2.1	2.2
22	18.9	7.0	5.6	7.0	4.6	2.2	12.5	2.0	2.6	5.7	2.0	2.2
23	19.8	9.0	5.4	6.8	4.6	2.0	12.4	2.1	2.4	5.4	2.0	2.2
24	20.3	10.2	5.1	7.0	5.0	1.8	12.2	2.2	2.2	5.2	2.0	2.2
25	20.7	10.1	4.9	7.2	6.2	1.7	12.1	2.0	2.1	5.0	2.0	2.2
26	21.0	10.1	4.9	7.5	7.3	1.6	9.1	1.9	2.0	4.8	2.0	2.2
27	21.0	11.5	4.9	6.7	7.6	1.5	7.2	1.8	2.0	4.6	2.0	2.2
28	20.5	13.8	4.8	6.1	7.6	1.4	5.5	1.8	1.9	4.3	2.2	2.2
29	19.4	.....	4.6	5.8	7.0	1.4	5.0	1.7	1.8	4.0	5.1	2.3
30	17.9	.....	4.4	5.5	5.9	2.5	7.2	1.7	1.8	3.7	6.4	2.5
31	16.4	.....	4.3	.....	5.2	.....	9.3	1.7	.....	3.4	.....	4.0

NOTE.—Relation of gage height to discharge probably affected by ice about Jan. 1 to 15, Feb. 18 to 28, and Dec. 11 to 29. River reported "frozen" Jan. 1, 4 to 8, 10 to 13, and Feb. 19.

EMBARRASS RIVER BASIN.

GENERAL FEATURES.

The drainage area of Embarrass River lies in the southeastern portion of the State of Illinois.

The river rises in the central part of Champaign County, near Urbana, flows in a southerly direction through Douglas, Coles, and Cumberland counties to the center of Jasper County, whence it takes an extremely tortuous but in general southeasterly course across

Jasper County, the southwestern corner of Crawford County, and Lawrence County to its junction with Wabash River, about midway between Vincennes, Ind., and St. Francisville, Ill. Exclusive of the bends, its length is about 125 miles, and its drainage area comprises 2,410 square miles. Its most important tributary is Hickory Creek, or North Fork Creek, which enters from the left bank about 2½ miles below St. Marie, Ill. The sources of the river are about 730 feet and the mouth about 400 feet above sea level.

The basin is long and narrow, with a length of about 100 miles and a fairly uniform width ranging from 15 to 30 miles. The surrounding country, which is level or gently rolling, is diversified by some small hills along the river. In the lower part of the basin, in the vicinity of St. Marie, the soil is sandy along the river; farther north and west it is the familiar black loam. To the east the soil is a light-colored clay, which was formerly covered with a heavy growth of "water oak." Near Oakland, in the upper part of the area, a sandy red soil occurs near the river and black loam away from the river. A mile back from the river on either side is prairie country.

In the southwestern part of the basin, west of Lawrenceville, there are extensive oil fields.

The chief crop in the valley of the Embarrass is corn. Some wheat is also grown. Forested areas are lacking in this basin.

The mean annual rainfall is about 40 inches. The winters are, as a rule, mild, the snowfall extending over a period of about two months and lasting only a few days at a time. For about a month ice in the river is 3 or 4 inches thick. During periods of extreme drought there is little flow in the river, for there are no springs in the basin and the ground-water storage is insufficient to maintain the low-water flow. In wet seasons the ground becomes saturated, and heavy rains reach the river too rapidly for the streams to care for them. Large areas of bottom land throughout the entire length of the river are inundated by the floods, which cause a great amount of damage. Land drainage and flood control are therefore subjects of much importance and are now under investigation. Little drainage work has been done in the uplands, but the bottoms have been drained to some extent. No water-power sites are available in this basin. The question of storage has not been studied.

The stations in this drainage are maintained in cooperation with the State of Illinois.

EMBARRASS RIVER NEAR OAKLAND, ILL.

This station, which is located at the highway bridge known as the "Antioch bridge," about 2 miles northwest of Oakland, Ill., on the county-line road to Hindsboro and Arcola, was established October 23, 1909.

Brush Creek enters from the left bank about 5 miles above the station. The total drainage area above the gaging station is 535 square miles.

The datum of the chain gage, attached to the bridge, has remained unchanged since its installation.

The data are accurate and reliable.

There was no flow at this station during a portion of the summer of 1908. The flood of 1897 reached a height of about 24 feet by the present gage datum.

Discharge measurements of Embarrass River near Oakland, Ill., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 8	M. E. McChristie	119	628	7.11	792
12	do	105	426	5.44	440
12	do	105	430	5.46	419
26	H. J. Jackson	160	894	9.02	1,230
July 21	Jackson and Hanson	98	367	4.85	280

Daily gage height, in feet, of Embarrass River near Oakland, Ill., for 1910.

[A. J. McDanels, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.7	4.7	13.0	3.35	4.75	5.1	4.35	5.6	1.9	3.1	2.7	3.55
2	4.9	4.8	12.5	3.45	5.0	4.8	3.5	5.05	1.9	2.95	2.7	3.7
3	5.85	5.1	10.5	3.35	5.25	4.6	4.65	4.2	1.95	2.9	2.75	3.8
4	5.9	5.0	10.0	3.3	6.2	4.5	4.95	3.45	1.95	4.0	2.65	3.95
5	5.8	4.95	9.2	3.25	5.65	4.4	5.0	3.0	2.8	5.85	2.65	3.8
6	5.85	4.9	8.4	3.2	5.45	4.3	5.55	2.8	3.95	6.6	2.6	3.7
7	5.6	4.65	7.3	3.15	5.25	4.1	5.9	2.75	4.4	6.55	2.6	3.7
8	5.4	4.6	6.9	3.2	5.2	4.0	5.05	2.6	4.95	6.4	2.7	3.5
9	5.0	4.5	6.1	3.25	6.95	3.9	4.75	2.55	4.5	6.15	2.65	3.35
10	4.6	4.45	5.8	3.25	6.8	3.8	4.0	2.45	4.3	5.8	2.75	3.2
11	4.4	4.2	5.55	3.25	6.8	3.75	3.05	2.4	4.15	5.6	2.75	3.2
12	5.2	4.0	5.4	3.3	7.7	3.5	3.4	2.35	4.0	5.55	2.75	3.25
13	10.55	4.0	5.2	3.35	7.7	3.4	4.25	2.25	3.9	5.3	2.75	3.15
14	14.15	3.95	5.15	3.4	7.6	3.35	3.9	2.35	3.7	5.05	2.65	3.2
15	15.0	3.95	4.9	3.45	7.3	3.3	3.6	2.3	3.4	4.8	2.65	3.1
16	13.5	3.9	4.8	3.5	6.25	3.2	9.9	2.6	3.05	4.5	2.55	3.0
17	11.2	3.85	4.7	3.9	5.8	3.1	9.0	2.55	2.75	3.95	2.4	3.05
18	12.5	3.85	4.5	4.05	5.15	3.0	8.55	2.45	2.75	3.8	2.4	2.9
19	13.5	3.9	4.3	4.0	5.0	2.8	7.95	2.35	2.65	3.55	2.3	2.85
20	12.4	3.8	4.25	4.0	4.8	2.75	6.25	2.15	2.55	3.3	2.25	2.9
21	10.45	3.9	4.2	3.9	4.45	2.7	5.6	2.1	2.55	3.1	2.2	2.8
22	9.0	4.1	4.15	3.9	4.2	2.55	5.15	2.15	2.5	3.05	2.25	2.75
23	7.6	4.2	4.1	3.9	7.9	2.55	4.5	2.05	2.85	2.9	2.3	2.7
24	6.2	3.9	4.0	3.9	9.1	2.5	3.9	2.1	2.95	2.9	2.2	2.65
25	6.0	4.1	3.95	3.95	9.5	2.4	3.55	2.0	2.95	2.85	2.25	2.7
26	5.8	4.2	3.95	4.2	8.55	2.3	3.2	2.0	2.95	2.8	2.2	2.6
27	5.6	5.0	3.9	4.2	7.1	3.5	3.15	1.95	3.2	2.8	2.3	2.65
28	5.3	9.0	3.85	4.2	6.1	4.7	3.6	1.9	3.3	2.7	2.75	2.55
29	5.1	.....	3.7	4.4	5.8	5.0	5.8	1.9	3.2	2.7	2.8	2.7
30	5.05	.....	3.55	4.5	5.6	5.1	6.35	1.85	3.1	2.6	3.0	2.95
31	4.8	.....	3.4	.....	5.5	.....	6.0	1.8	.....	2.6	.....	3.9

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 to 11, Feb. 17 to 21, and Dec. 11 to 31. Dec. 26 to 31 gage read to top of ice.

Daily discharge, in second-feet, of Embarrass River near Oakland, Ill., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	300	278	2,710	90	288	356	218	456	8	68	43	110
2	300	297	2,500	100	336	297	105	346	8	58	43	128
3	300	356	1,750	90	386	260	269	194	9	55	46	140
4	300	336	1,580	85	583	243	326	100	9	165	40	158
5	300	326	1,330	90	466	226	336	61	49	508	40	140
6	300	316	1,100	76	426	210	446	49	158	671	37	128
7	300	269	830	72	386	179	519	46	226	660	37	128
8	200	260	737	76	376	165	346	37	326	627	43	105
9	200	243	561	80	748	152	288	34	243	572	40	90
10	200	234	498	80	715	140	165	30	210	498	46	76
11	200	194	446	80	715	134	64	27	186	456	46	60
12	376	165	416	85	926	105	95	24	165	446	46	50
13	1,770	165	376	90	926	95	202	20	152	396	46	40
14	3,200	158	366	95	902	90	152	24	128	346	40	30
15	3,560	158	316	100	830	85	116	22	95	297	40	30
16	2,920	152	297	105	594	76	1,550	37	64	243	34	25
17	2,000	100	278	152	498	68	1,270	34	46	158	27	25
18	2,500	100	243	172	366	61	1,150	30	46	140	27	20
19	2,920	50	210	165	336	49	988	24	40	110	22	20
20	2,460	40	202	165	297	46	594	15	34	85	20	20
21	1,730	60	194	152	234	43	456	13	34	68	17	15
22	1,270	179	186	152	194	34	366	15	32	64	20	15
23	902	194	179	152	975	34	243	12	52	55	22	15
24	583	152	165	152	1,300	32	152	13	58	55	17	15
25	540	179	158	158	1,420	27	110	10	58	52	20	15
26	498	194	158	194	1,150	22	76	10	58	49	17	20
27	456	336	152	194	783	105	72	9	76	49	22	20
28	396	1,270	146	194	561	278	116	8	85	43	46	30
29	356	.....	128	226	498	336	498	8	76	43	49	40
30	346	.....	110	243	456	356	616	7	68	37	61	50
31	297	.....	95	.....	436	.....	540	6	.....	37	.....	100

NOTE.—Daily discharge determined by means of a discharge rating curve well defined between 22 and 1,000 second-feet (gage heights 2.3 and 8.0 feet); fairly well defined between 1,030 and 1,550 second-feet (gage heights 8.1 and 9.9 feet), and is an extension above discharge 1,580 second-feet (gage height 10.0 feet).

Daily discharge Jan. 1 to 11, Feb. 17 to 21, and Dec. 11 to 31 estimated because of ice, from climatologic records and records of run-off in adjacent drainage areas.

Monthly discharge of Embarrass River near Oakland, Ill., for 1910.

[Drainage area, 535 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	3,560	200	1,030	1.93	2.22	C.
February	1,270	40	241	.450	.47	A.
March	2,710	95	594	1.11	1.28	B.
April	243	72	128	.239	.27	A.
May	1,420	194	616	1.15	1.33	A.
June	356	22	143	.267	.30	A.
July	1,550	64	401	.750	.86	A.
August	456	6	55.5	.104	.12	B.
September	326	8	93.3	.174	.19	A.
October	671	37	229	.428	.49	A.
November	61	17	35.1	.066	.07	B.
December	158	15	59.9	.112	.13	D.
The year	3,560	6	305	.570	7.73	

EMBARRASS RIVER AT ST. MARIE, ILL.

This station, which is located at the highway bridge at the north end of Main Street, St. Marie, Ill., about 150 yards downstream from

the Cincinnati, Hamilton & Dayton Railway bridge, was established October 20, 1909.

Hickory Creek, or North Fork Creek, enters from the left bank about 2½ miles below the station. The total drainage area above the gaging station is 1,540 square miles.

The datum of the chain gage, attached to the highway bridge, has remained unchanged since its installation.

The data are accurate and reliable.

The flood of the spring of 1908 reached a height of about 22.5 feet by the present gage.

Discharge measurements of Embarrass River at St. Marie, Ill., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec. ft.*
Mar. 5	M. E. McChristie	174	2,160	16.01	4,600
Apr. 8	H. J. Jackson	112	462	3.70	301
May 14	C. T. Bailey	122	1,040	8.67	1,780
15	do	120	955	8.06	1,570
16	do	118	839	7.18	1,210
17	do	117	760	6.53	1,010
17	do	117	753	6.43	1,000
18	do	116	711	6.06	953
Dec. 19	P. S. Monk	111	348	3.49	265

Daily gage height, in feet, of Embarrass River at St. Marie, Ill., for 1910.

[Observers: T. L. Britton, Jan. 1 to Apr. 16; Harvey Dalton, Apr. 17 to Aug. 14; and V. C. Wuerth, Aug. 15 to Dec. 31.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.9	18.7	4.0	4.4	5.2	5.1	8.5	2.5	2.6	3.1	8.7
2	.....	5.5	18.3	4.1	4.3	5.6	4.5	8.0	2.4	2.4	3.1	6.8
3	.....	6.0	17.7	3.9	6.0	5.2	5.2	5.6	2.4	2.4	3.0	5.9
4	.....	6.8	17.2	3.9	13.2	.....	6.9	5.0	2.6	5.7	3.0	5.4
5	.....	6.1	15.9	3.9	10.0	.....	10.7	4.5	2.7	14.4	3.0	5.1
6	.....	5.7	14.2	3.9	7.1	.....	10.3	4.1	2.5	17.6	2.9	4.7
7	.....	5.4	12.4	3.8	6.1	.....	7.1	4.2	2.5	18.7	2.9	4.5
8	5.4	5.0	10.5	3.7	7.1	.....	6.1	3.7	4.2	18.5	2.9	4.2
9	.....	4.9	9.2	3.6	9.1	.....	6.2	3.6	6.1	16.5	2.9	4.1
10	.....	4.9	8.4	3.5	8.1	4.1	5.0	3.5	5.9	12.8	2.8	3.9
11	.....	4.7	7.6	3.4	7.5	4.0	4.5	3.4	5.0	8.8	2.8	3.8
12	.....	4.5	7.1	3.4	11.1	3.7	4.2	3.3	4.4	7.2	2.7	3.6
13	7.2	4.3	6.7	3.3	11.4	3.5	5.3	3.2	4.0	6.3	2.7	3.8
14	14.0	5.5	6.4	3.3	8.8	3.6	4.9	3.1	4.8	5.8	2.7	3.7
15	16.0	5.0	6.1	3.3	7.9	3.6	5.1	2.8	3.8	5.5	2.7	3.5
16	16.0	5.0	5.8	6.2	7.0	3.2	15.5	2.8	3.5	5.0	2.6	3.5
17	15.1	4.7	5.5	10.3	6.5	3.2	18.5	3.1	3.2	4.8	2.6	3.4
18	15.3	4.9	5.4	9.1	6.0	3.1	18.9	3.2	3.0	4.5	2.6	3.4
19	15.9	4.9	5.2	6.7	5.7	3.1	18.3	3.7	2.8	4.3	2.6	3.4
20	17.4	4.9	5.1	6.3	5.4	3.0	16.2	3.6	2.6	4.1	2.5	3.2
21	17.1	5.2	5.0	5.4	5.2	2.9	12.0	3.1	2.6	4.1	2.5	3.6
22	15.3	6.5	4.9	5.5	5.1	2.8	8.1	2.8	2.5	3.9	2.4	3.4
23	12.9	7.4	4.7	4.9	7.5	2.9	6.9	2.8	2.5	3.8	2.4	3.2
24	10.3	7.1	4.6	4.8	12.0	2.7	6.0	2.8	2.5	3.8	2.4	3.4
25	8.7	6.5	4.5	4.5	9.3	2.6	5.5	2.8	2.4	3.7	2.4	2.9
26	7.8	5.6	4.5	4.3	8.9	2.9	5.1	3.0	3.1	3.5	2.4	2.9
27	7.5	15.7	4.3	4.8	8.2	4.0	4.9	6.2	3.1	3.5	2.8	3.0
28	7.4	18.1	4.2	4.9	9.1	4.3	4.3	4.8	3.0	3.4	11.3	3.4
29	6.9	.....	4.2	4.5	7.3	7.0	8.2	3.2	2.8	3.3	15.6	5.9
30	6.4	.....	4.1	4.4	7.2	5.4	10.2	2.9	2.7	3.2	12.8	9.4
31	6.1	.....	4.0	.....	5.9	.....	11.2	2.7	.....	3.2	.....	8.5

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 to 16. Gage read to top of ice Jan. 13 to 16, Feb. 18 to 20, and Dec. 25 and 26.

Daily discharge, in second-feet, of Embarrass River at St. Marie, Ill., for 1909–10.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1909.				1909.				1909.			
1	.....	122	345	11	.....	122	250	21	174	291	500
2	.....	122	326	12	.....	122	465	22	140	259	400
3	.....	129	291	13	.....	122	3,110	23	126	769	400
4	.....	122	259	14	.....	122	4,790	24	202	2,300	400
5	.....	122	259	15	.....	129	4,710	25	275	1,200	400
6	.....	115	259	16	.....	129	3,930	26	179	893	350
7	.....	118	291	17	.....	160	2,740	27	144	740	350
8	.....	118	250	18	.....	423	1,830	28	136	579	350
9	.....	118	250	19	.....	259	1,340	29	144	465	350
10	.....	122	250	20	179	190	800	30	136	423	350
								31	129	.....	350

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	400	799	5,860	345	423	604	579	1,720	144	152	202	1,790
2	400	683	5,690	364	403	711	444	1,530	136	136	202	1,100
3	400	830	5,450	326	830	604	604	711	136	136	190	799
4	500	1,100	5,240	326	3,600	570	1,130	555	152	740	190	656
5	500	861	4,710	326	2,300	535	2,580	444	160	4,090	190	579
6	500	740	4,010	326	1,200	501	2,420	364	144	5,410	179	487
7	500	656	3,270	308	861	467	1,200	383	144	5,860	179	444
8	500	555	2,500	291	1,200	433	861	291	383	5,780	179	383
9	400	532	1,980	275	1,940	398	893	275	861	4,960	179	364
10	400	532	1,680	259	1,570	364	555	259	799	3,440	169	326
11	400	487	1,380	244	1,340	345	444	244	555	1,830	169	308
12	800	444	1,200	244	2,740	291	383	229	423	1,240	160	275
13	1,000	403	1,060	229	2,860	259	630	215	345	926	160	308
14	3,500	683	959	229	1,830	275	532	202	509	769	160	291
15	4,500	555	861	229	1,490	275	579	169	308	683	160	259
16	4,500	555	769	893	1,160	215	4,540	169	259	555	152	259
17	4,380	487	683	2,420	992	215	5,780	202	215	509	152	244
18	4,460	532	656	1,940	830	202	5,940	215	190	444	152	244
19	4,710	532	604	1,060	740	202	5,690	291	169	403	152	244
20	5,320	532	579	926	656	190	4,830	275	152	364	144	215
21	5,200	604	555	656	604	179	3,110	202	152	364	144	275
22	4,460	992	532	683	579	169	1,570	169	144	326	136	244
23	3,480	1,310	487	532	1,340	179	1,130	169	144	308	136	215
24	2,420	1,200	465	509	3,110	160	830	169	144	308	136	244
25	1,790	992	444	444	2,020	152	683	169	136	291	136	179
26	1,460	711	444	403	1,870	179	579	190	202	259	136	179
27	1,340	4,630	403	509	1,600	345	532	893	202	259	169	190
28	1,310	5,610	383	532	1,940	403	403	509	190	244	2,820	244
29	1,130	.....	383	444	1,270	1,160	1,600	215	169	229	4,590	799
30	959	.....	364	423	1,240	656	2,380	179	160	215	3,440	2,060
31	861	.....	345	.....	799	.....	2,780	160	.....	215	.....	1,720

NOTE.—Discharge for 1909 redetermined by means of a rating curve which was revised as result of discharge measurements made since 1909. Daily discharge, 1910, determined by means of the revised rating curve, which is poorly defined below 160 second-feet (gage height 2.7 feet); well defined between 169 and 1,870 second-feet (gage heights 2.8 and 8.9 feet); fairly well defined between 1,900 and 4,750 second-feet (gage heights 9.0 and 16.0 feet); and above 4,750 second-feet (gage height 16.0 feet) is extended on a tangent which starts at discharge 2,700 second-feet (gage height 11.0 feet). Discharge Dec. 8 to 11, 1909, and Dec. 20, 1909, to Jan. 16, 1910, estimated, because of ice, from climatologic records and records of run-off in adjacent drainage areas. Because of the revision the figures in these tables differ from those published by the Internal Improvement Commission of Illinois in its report for 1908–1910.

Monthly discharge of Embarrass River at St. Marie, Ill., for 1909–10.

[Drainage area, 1,540 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1909.						
October 20–31	275	126	164	0.106	0.05	B.
November	2,300	115	364	.236	.26	A.
December	4,790	250	998	.648	.75	B.
1910.						
January	5,320	400	2,020	1.31	1.51	B.
February	5,610	403	1,020	.662	.69	A.
March	5,860	345	1,740	1.13	1.30	A.
April	2,420	229	556	.361	.40	A.
May	3,600	403	1,460	.948	1.09	A.
June	1,160	152	375	.244	.27	A.
July	5,940	383	1,810	1.18	1.36	A.
August	1,720	160	380	.247	.28	A.
September	861	136	261	.169	.19	A.
October	5,860	136	1,340	.870	1.00	A.
November	4,590	136	509	.331	.37	A.
December	2,060	179	514	.334	.39	B.
The year	5,940	136	1,000	.649	8.85	

NOTE.—See footnotes to daily discharge table.

WHITE RIVER BASIN.

EAST BRANCH OF WHITE RIVER AT SHOALS, IND.

White River, the largest tributary of Wabash River, is formed by the junction of the East and West branches near Petersburg, Ind., and discharges into the Wabash above Mount Carmel, Ill. The area of the oval-shaped basin comprises about one-half of the Wabash drainage in Indiana, or one-sixth of the entire State.

The two branches rise in eastern Indiana at an elevation of about 1,000 feet and flow in a general southwesterly direction nearly across the State. The West Branch rises in Randolph County near the Ohio-Indiana State line, flows west to Hamilton County near the center of the State, then southwest to its junction with the East Branch. The East Branch is formed in Bartholomew County by several streams which have their sources in Henry and Hancock counties. Its course is south and west through Jackson, Lawrence, Martin, and Daviess counties to the junction with the West Branch.

The fall is much greater on the East and West branches of the White than on the Wabash, and these streams afford good water-power sites which have not been utilized to a great extent because of the abundance of cheap fuel.

The gaging station, which is located at the highway bridge between East Shoals and West Shoals, Ind., a short distance above the Baltimore & Ohio Southwestern Railroad bridge, was established June

25, 1903, discontinued July 21, 1906, and reestablished October 12, 1908.

The bed of the river is of solid rock and the estimates of the flow at this station should be excellent. Gage readings are taken from December 1 to May 31 by the United States Weather Bureau.

The datum of the chain gage, which is attached to the highway bridge, was raised 61 feet on January 1, 1909, so as to be the same as that used by the Weather Bureau.

The records are reliable and accurate. The winters are mild in this vicinity and the winter flow is affected but little by ice.

Discharge measurements of East Branch of White River at Shoals, Ind., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec. ft.*
Mar. 24	M. E. McChristie	321	828	3.84	2,420
Oct. 29 [a]	R. H. Bolster	308	815	3.79	1,970

[a] Drift collected in left-hand span of railroad bridge, below bridge from which measurement was made.

Daily gage height, in feet, of East Branch of White River at Shoals, Ind., for 1910.

[O. H. Greist, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.1	5.2	14.5	3.5	3.8	3.6	3.45	4.3	3.05	2.7	3.6	5.4
2	3.2	4.9	15.2	3.4	3.8	3.5	3.45	3.95	3.15	2.6	3.5	4.9
3	3.5	4.8	17.9	3.4	3.9	3.4	3.35	3.85	3.05	2.6	3.5	4.4
4	4.6	4.6	20.5	3.4	4.2	3.3	3.15	3.7	3.2	2.9	3.4	4.05
5	4.0	4.6	22.2	3.4	4.7	3.3	3.1	3.5	3.3	5.5	3.4	3.85
6	4.8	4.6	22.3	3.4	4.7	3.2	3.3	3.4	4.5	15.5	3.4	3.7
7	5.4	4.6	20.6	3.3	4.7	3.2	4.05	3.3	4.45	18.65	3.4	3.6
8	5.6	4.5	16.3	3.5	4.9	3.2	4.5	3.2	4.0	17.55	3.4	3.5
9	5.2	4.3	11.2	3.4	5.3	3.1	5.0	3.1	3.95	17.2	3.4	3.4
10	4.8	4.2	7.7	3.4	5.9	3.1	5.1	3.1	3.65	19.55	3.4	3.4
11	4.6	4.1	6.1	3.3	6.0	3.1	5.1	3.0	3.5	21.95	3.3	3.35
12	3.9	4.1	5.5	3.4	5.8	3.1	5.0	3.0	3.35	23.55	3.3	3.3
13	4.4	3.9	5.2	3.5	5.6	3.1	5.2	2.9	3.15	23.65	3.2	3.2
14	8.9	3.8	4.9	3.4	5.2	3.2	4.75	2.9	3.1	22.15	3.2	3.2
15	9.9	3.8	4.7	3.6	4.9	3.2	4.55	2.9	3.0	18.55	3.2	3.15
16	8.4	3.8	4.5	3.7	4.6	3.1	5.05	2.8	2.9	11.8	3.2	3.2
17	11.2	4.0	4.4	4.5	4.3	3.1	6.7	2.8	2.8	7.5	3.2	3.2
18	12.5	4.8	4.3	4.4	4.1	3.1	6.9	2.9	2.7	6.0	3.1	3.1
19	16.1	5.6	4.2	5.0	4.1	2.9	8.15	2.8	2.7	5.15	3.1	3.1
20	17.3	5.6	4.1	5.7	4.0	2.9	8.65	2.8	2.7	4.9	3.1	3.0
21	17.7	5.7	4.0	5.7	4.0	2.8	9.2	2.8	2.6	4.6	3.1	3.0
22	18.0	6.8	4.0	5.6	4.3	2.8	9.45	2.75	2.6	4.5	3.1	2.85
23	17.6	8.1	3.9	5.2	5.0	2.7	7.85	2.95	2.6	4.35	3.1	3.0
24	16.0	9.1	3.8	4.8	5.4	2.7	6.25	2.8	2.6	4.3	3.1	3.0
25	12.8	8.6	3.7	4.5	5.3	2.7	5.2	2.7	2.7	4.2	3.05	2.9
26	9.4	8.3	3.7	4.2	5.1	2.7	4.45	2.7	2.8	4.1	3.0	2.8
27	7.3	8.3	3.7	4.1	4.8	2.8	4.3	2.8	2.8	4.0	3.0	2.8
28	6.3	12.3	3.6	4.0	4.6	3.2	4.25	2.9	2.7	3.9	3.75	3.25
29	5.8	.....	3.6	3.9	4.3	3.1	4.6	3.0	2.7	3.8	4.85	4.25
30	5.8	.....	3.6	3.9	4.0	3.2	5.3	2.9	2.7	3.7	5.45	6.0
31	5.7	.....	3.5	.....	3.8	.....	5.0	2.9	.....	3.7	.....	7.7

NOTE.—No record of ice kept by observer. Relation of gage height to discharge probably not affected by ice.

Daily discharge, in second-feet, of East Branch of White River at Shoals, Ind., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,270	6,080	22,200	1,890	2,460	2,070	1,800	3,710	1,200	770	1,680	5,970
2	1,410	5,320	23,300	1,720	2,460	1,890	1,800	2,800	1,340	670	1,530	4,680
3	1,890	5,060	27,400	1,720	2,680	1,720	1,640	2,570	1,200	670	1,530	3,350
4	4,520	4,520	31,200	1,720	3,440	1,560	1,340	2,260	1,410	1,000	1,400	2,510
5	2,920	4,520	33,800	1,720	4,790	1,560	1,270	1,890	1,560	6,800	1,400	2,100
6	5,060	4,520	34,000	1,720	4,790	1,410	1,560	1,720	4,250	23,800	1,400	1,840
7	6,560	4,520	31,400	1,560	4,790	1,410	3,050	1,560	4,120	28,500	1,400	1,680
8	7,040	4,250	25,000	1,890	5,320	1,410	4,250	1,410	2,920	26,800	1,400	1,530
9	6,080	3,710	17,300	1,720	6,320	1,270	5,580	1,270	2,800	26,300	1,400	1,400
10	5,060	3,440	11,400	1,720	7,730	1,270	5,830	1,270	2,160	29,800	1,400	1,400
11	4,520	3,180	8,170	1,560	7,950	1,270	5,830	1,130	1,890	33,400	1,280	1,340
12	2,680	3,180	6,800	1,720	7,500	1,270	5,580	1,130	1,640	35,800	1,280	1,280
13	3,980	2,680	6,080	1,890	7,040	1,270	6,080	1,000	1,340	36,000	1,170	1,170
14	13,600	2,460	5,320	1,720	6,080	1,410	4,920	1,000	1,270	33,700	1,170	1,170
15	15,200	2,460	4,790	2,070	5,320	1,410	4,380	1,000	1,130	28,300	1,170	1,120
16	12,700	2,460	4,250	2,260	4,520	1,270	5,700	880	1,000	18,200	1,170	1,170
17	17,300	2,920	3,980	4,250	3,710	1,270	9,450	880	880	10,600	1,170	1,170
18	19,200	5,060	3,710	3,980	3,180	1,270	9,850	1,000	770	7,400	1,060	1,060
19	24,600	7,040	3,440	5,580	3,180	1,000	12,200	880	770	5,330	1,060	1,060
20	26,400	7,040	3,180	7,270	2,920	1,000	13,100	880	770	4,680	1,060	965
21	27,000	7,270	2,920	7,270	2,920	880	14,100	880	670	3,890	1,060	965
22	27,500	9,650	2,920	7,040	3,710	880	14,500	825	670	3,620	1,060	820
23	26,900	12,100	2,680	6,080	5,580	770	11,700	1,060	670	3,220	1,060	965
24	24,500	13,900	2,460	5,060	6,560	770	8,500	880	670	3,090	1,060	965
25	19,700	13,000	2,260	4,250	6,320	770	6,080	770	770	2,850	1,020	865
26	14,400	12,500	2,260	3,440	5,830	770	4,120	770	880	2,620	965	775
27	10,600	12,500	2,260	3,180	5,060	880	3,710	880	880	2,400	965	775
28	8,610	19,000	2,070	2,920	4,520	1,410	3,580	1,000	770	2,200	1,920	1,220
29	7,500	.....	2,070	2,680	3,710	1,270	4,660	1,130	770	2,010	4,550	2,970
30	7,500	.....	2,070	2,680	2,920	1,410	6,320	1,000	770	1,840	6,100	7,400
31	7,270	.....	1,890	.....	2,460	.....	5,580	1,000	.....	1,840	.....	11,100

NOTE.—Daily discharge, Jan. 1 to Oct. 16, determined from a rating curve that is based on discharge measurements made from 1903 to October, 1910, is well defined below 4,250 second-feet (gage height 4.5 feet), reverses at about 4,250 second-feet (gage height 4.5 feet), and is drawn on a tangent above 17,000 second-feet (gage height 11.0 feet). Daily discharge, Oct. 17 to Dec. 31, determined from a rating curve that is based on 1 discharge measurement made Oct. 29, 1910, and the shape of the previous curve being approximately parallel to previous curve above 2,400 second-feet (gage height 4.0 feet). This curve reverses at about 3,620 second-feet (gage height 4.5 feet) and is not well defined. The change indicated by the discharge measurement made Oct. 29, 1910, is probably due to drift lodged in the channel below the gaging section. The date and stage for change from one curve to the other are very uncertain.

Monthly discharge of East Fork of White River at Shoals, Ind., for 1910.

[Drainage area, 4,900 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	27,500	1,270	11,700	2.39	2.76	B.
February	19,000	2,460	6,590	1.34	1.40	B.
March	34,000	1,890	10,700	2.18	2.51	B.
April	7,270	1,560	3,140	.641	.72	A.
May	7,950	2,460	4,700	.959	1.11	A.
June	2,070	770	1,260	.257	.29	A.
July	14,500	1,270	6,070	1.24	1.43	A.
August	3,710	770	1,300	.265	.31	A.
September	4,250	670	1,400	.286	.32	A.
October	36,000	670	12,500	2.55	2.94	B.
November	6,100	965	1,530	.312	.35	B.
December	11,100	775	2,150	.439	.51	B.
The year	36,000	670	5,290	1.08	14.66	

LITTLE WABASH RIVER BASIN.

GENERAL FEATURES.

The drainage basin of Little Wabash River lies in the southeastern part of the State of Illinois.

The river rises in the southwestern corner of Coles County, flows slightly southeastward, and discharges into Wabash River about 15 miles above its mouth, at the boundary line between White and Gallatin counties. Skillet Fork, its only important tributary, joins it not far above its mouth. The Little Wabash is about 150 miles long, and its drainage area comprises 3,200 square miles. The elevation of the sources of the river is about 720 feet; at its mouth it is about 340 feet above sea level.

The basin is shaped somewhat like a parallelogram, with the long sides north and south. The country is level or undulating. The soil, a rich black loam in the northern part, gradually changes into a yellow clay or "mulatto soil" in the southern part. There are no forested areas in this basin.

The annual rainfall is about 42 inches. The winters are mild; ice does not form very thick and snowfall is light and does not last long.

No water-power sites exist anywhere in this basin.

The question of storage has not been investigated, though it is recognized as important in connection with the growing demand for water supplies and the general subjects of drainage and flood control. The United States Department of Agriculture is making a study of the surface with a view to formulating a plan for reclaiming and protecting areas that are overflowed during floods. Portions of the river have already been mapped for use in this study.

The gaging stations in this drainage are maintained in cooperation with the State of Illinois.

LITTLE WABASH RIVER NEAR CLAY CITY, ILL.

This station, which is located at the Baltimore & Ohio Southwestern Railroad bridge, about 2 miles east of Clay City, Ill., was established October 3, 1908.

Big Muddy Creek enters from the left bank, about 5 miles below the section. The total drainage area above the gaging station is 808 square miles.

This station is at the toe of a horseshoe bend in the river, and the ground inside the bend along the railroad track is low. During high water the Little Wabash overflows into Little Muddy Creek, a branch of Big Muddy Creek, and in extreme high water also overflows into Big Muddy Creek, forming at such times a sheet of water about 4 miles wide along the railroad embankment. The discharge of the Little Wabash at the gaging station during extreme high water can not be determined on account of the above conditions, for the water

which passes the gaging station includes some of the flood water of Big Muddy Creek. The station is not good for measurement of low-water flow because of comparatively large area of the section and low velocity of the current at low stages. Springs feed the river near the gaging station, and the river has not been known to go dry at this point. The flood of February 8, 1909, reached a height of about 23.7 feet by the present gage datum.

The datum of the chain gage, attached to the railroad bridge, has remained unchanged since its installation, and the records are reliable and accurate.

Sufficient data have not yet been obtained to enable estimates of flow to be made.

Discharge measurements of Little Wabash River near Clay City, Ill., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 4	Jackson and McChristie	1,703	6,970	18.73	[a]9,760
11	H. J. Jackson	64	342	8.92	317
11	do	64	341	8.89	302
Dec. 18	Bailey and Monk	51	193	6.50	49.1

[a] Includes Little Muddy and Big Muddy creeks.

Daily gage height, in feet, of Little Wabash River near Clay City, Ill., for 1910.

[Wm. F. Davis, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.9	8.4	18.75	6.7	7.9	10.4	7.8	6.85	6.8	7.05	6.15	12.35
2	7.0	8.9	19.5	6.7	7.4	8.7	7.2	6.8	6.6	7.0	6.2	9.4
3	7.1	8.9	19.0	6.7	7.1	8.0	7.0	6.7	6.9	6.4	6.2	8.3
4	7.1	9.45	18.7	6.7	7.1	7.7	7.0	6.7	7.0	10.55	6.15	7.85
5	8.4	11.2	18.5	6.9	10.55	7.8	11.7	6.5	8.0	18.1	6.1	7.4
6	8.9	10.2	18.3	7.0	10.8	10.2	13.7	6.5	8.3	18.7	6.1	7.15
7	9.3	9.0	17.0	7.0	9.0	10.1	14.2	6.4	7.9	19.0	6.05	7.2
8	9.3	8.4	13.35	7.0	9.4	8.4	12.0	6.4	9.8	18.8	6.1	7.1
9	9.3	7.85	11.3	7.0	11.6	7.9	9.5	6.4	12.3	19.1	6.05	6.85
10	7.9	7.4	9.3	7.0	12.5	7.4	9.0	6.4	14.0	19.0	6.1	6.9
11	7.3	7.55	8.95	6.8	11.5	7.3	8.8	6.4	11.0	18.7	6.1	6.85
12	7.3	7.45	8.5	6.6	9.7	7.3	8.4	6.3	10.4	16.8	6.05	6.9
13	10.05	7.3	8.3	6.55	13.5	7.2	7.7	6.3	7.1	12.8	6.1	6.8
14	15.9	7.3	8.0	6.55	15.4	7.0	7.7	6.3	6.85	10.6	6.05	6.65
15	18.0	7.9	7.9	6.55	.....	6.8	7.7	6.25	6.7	7.95	6.1	6.6
16	18.2	9.4	7.7	7.0	9.7	6.7	9.0	6.25	6.65	7.8	6.05	6.55
17	18.2	9.4	7.5	8.6	8.6	6.6	16.9	6.25	6.7	7.45	6.1	6.6
18	17.9	9.4	7.4	9.6	8.15	6.5	18.0	6.25	6.45	7.4	6.1	6.55
19	17.55	9.2	7.3	9.9	7.9	6.5	18.1	6.2	6.5	7.4	6.05	6.6
20	17.8	9.2	7.2	9.3	7.8	7.4	18.15	6.2	6.4	7.25	6.1	6.6
21	18.0	9.2	7.1	8.4	7.6	6.6	18.1	6.3	6.35	7.2	6.15	6.6
22	17.45	10.2	7.1	8.0	7.6	6.4	16.1	6.7	6.4	6.75	6.2	6.5
23	14.0	12.7	7.1	7.7	7.5	6.4	9.6	6.8	6.25	6.8	6.2	6.5
24	10.4	13.3	7.3	7.4	12.3	6.4	8.5	6.8	6.3	6.8	6.15	6.5
25	9.5	12.5	7.3	7.3	16.1	.....	8.0	6.8	6.2	6.75	6.2	6.5
26	9.0	10.2	7.3	7.4	17.1	6.3	7.5	6.8	6.15	6.8	6.15	6.5
27	8.9	14.45	7.0	7.7	17.3	6.6	7.4	12.3	6.2	6.75	6.2	6.5
28	9.5	18.8	6.8	8.6	14.1	6.6	7.3	12.9	7.15	6.7	6.3	6.5
29	9.95	.....	6.8	9.0	13.4	12.0	7.1	10.1	7.2	6.6	6.35	6.5
30	9.0	.....	6.7	8.2	8.9	9.0	7.0	7.7	7.1	6.35	12.9	6.9
31	8.9	.....	6.7	.....	9.5	.....	7.0	7.1	.....	6.3	.....	10.2

NOTE.—No ice reported by observer. Relation of gage height to discharge probably affected by ice about Jan. 1 to 3 and Dec. 15 to 31.

LITTLE WABASH RIVER NEAR GOLDEN GATE, ILL.

This station, which is located at the Southern Railway bridge about 1 mile west of Golden Gate, Ill., was established August 17, 1908.

Elm Creek enters from the right bank about 3 miles above the station. The total drainage area above the gaging station is 1,780 square miles.

The datum of the chain gage, which is attached to the railroad bridge, has not been changed since its installation, and the records are accurate and reliable.

The stream does not go dry at this point.

During high water there is flow through three openings in the railroad embankment east of the main channel. All of the flood flow can be measured.

No reliable estimates of discharge can yet be made, because of the backwater which is known to occur at this station at times.

Discharge measurements of Little Wabash River near Golden Gate, Ill., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 2	Jackson and McChristie	1,228	9,420	23.59	9,150
7	H. J. Jackson	1,252	13,100	25.42	9,520
9	do	1,239	11,900	24.56	8,400
12	do	1,215	7,650	22.23	4,240
14	do	207	2,360	18.65	2,080
15	do	155	1,760	15.50	1,170
16	do	124	1,070	10.25	747
17	do	93	630	6.48	410
Dec. 15	Bailey and Monk	76	328	3.05	[a] 76.3
16	do	76	323	2.90	[a] 59.7

[a] Measurements made with slightly damaged meter. Relation of gage height to discharge affected by ice.

Daily gage height, in feet, of Little Wabash River near Golden Gate, Ill., for 1910.

[Ben Chalcraft, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.7	7.7	22.2	3.3	6.5	7.0	6.8	4.3	3.95	3.45	3.1	8.45
2	4.7	6.9	23.3	3.0	6.0	6.1	6.1	3.75	3.6	3.4	2.95	8.55
3	5.1	6.2	24.3	3.3	6.5	6.2	5.4	3.3	3.25	3.05	2.75	7.95
4	5.2	5.9	25.4	3.2	5.3	5.1	4.3	3.15	3.1	7.5	2.65	6.55
5	5.3	7.2	25.8	3.1	4.7	4.4	6.8	3.1	6.95	14.45	2.65	5.2
6	6.2	9.5	25.8	3.0	4.3	4.2	9.15	3.0	12.5	20.4	2.9	4.25
7	8.0	9.0	25.5	3.4	7.3	4.3	11.4	2.85	14.1	22.5	2.95	3.95
8	7.7	7.4	25.1	3.5	8.1	6.5	12.35	2.8	15.2	24.2	2.85	3.75
9	7.3	6.9	24.7	3.8	6.7	6.6	12.6	2.65	15.7	24.9	2.75	3.55
10	7.0	6.0	24.3	3.8	5.6	5.5	11.3	2.7	15.1	25.7	2.65	3.5
11	6.6	5.4	23.6	3.4	7.5	4.6	8.45	2.7	14.8	25.7	2.7	3.35
12	5.0	5.2	22.7	3.8	8.9	4.1	7.3	2.55	14.5	25.6	2.65	3.35
13	8.0	4.3	21.3	5.7	7.5	4.1	6.95	2.6	12.5	25.4	2.55	2.75
14	14.8	4.5	19.7	5.0	7.0	4.7	6.2	2.55	8.4	25.2	2.55	2.95
15	16.5	4.5	16.7	4.6	11.2	4.3	5.3	2.6	5.75	24.8	2.55	3.1
16	17.2	4.5	12.4	5.4	11.5	3.9	4.65	2.5	4.65	24.4	2.5	2.85
17	17.6	4.4	7.6	7.4	9.9	3.5	8.4	2.45	3.7	23.9	2.65	2.9
18	18.0	5.5	4.9	9.7	7.5	3.3	12.75	2.5	3.45	23.8	2.55	2.9
19	18.5	5.9	4.6	12.0	7.4	3.1	14.4	2.35	3.3	22.1	2.55	2.8
20	19.6	7.1	4.4	11.5	6.5	3.0	15.0	2.4	3.05	20.1	2.55	2.8

Daily gage height, in feet, of Little Wabash River near Golden Gate, Ill., for 1910—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	20.3	7.5	4.1	9.9	5.1	3.0	15.45	2.5	2.85	17.35	2.5	2.7
22	20.3	9.4	4.1	8.1	4.5	5.9	15.1	2.35	2.8	13.4	2.45	2.6
23	20.5	12.9	4.1	6.5	4.6	5.4	14.95	3.9	2.35	7.75	2.45	2.6
24	20.3	14.6	4.0	6.0	7.9	4.9	15.0	3.55	2.6	4.35	2.45	2.6
25	19.7	15.4	3.9	5.5	9.9	4.2	14.9	3.5	2.45	3.95	2.45	2.5
26	18.8	15.8	3.8	5.6	12.1	3.5	13.15	4.1	2.45	3.65	2.4	2.6
27	16.5	17.9	3.9	6.0	12.6	3.0	9.0	3.55	2.6	3.3	2.65	2.7
28	12.5	20.1	3.8	6.5	13.0	3.5	5.95	4.4	2.45	2.65	5.85	2.9
29	9.8	.....	3.6	6.7	13.0	4.4	4.9	7.45	2.5	2.55	7.45	4.2
30	9.0	.....	3.5	7.0	11.5	5.4	3.4	6.5	2.55	2.95	8.15	7.3
31	8.9	.....	3.4	.....	9.0	.....	4.75	5.75	.....	3.05	.....	9.2

NOTE.—Relation of gage height to discharge affected by ice about Dec. 11 to 20.

LITTLE WABASH RIVER AT CARMI, ILL.

This station, which is located at the highway bridge in the northeastern part of Carmi, Ill., about one-fourth mile below the bridge of the Big Four and Louisville & Nashville railroads, was established October 9, 1908.

Skillet Fork River enters on the right bank about 4½ miles above the station. The drainage area above the gaging section is 3,090 square miles.

The relation between discharge and gage height at this station is affected by backwater from Wabash and Ohio rivers. There is but one channel at all stages.

The datum of the chain gage, attached to the highway bridge, has remained unchanged since its installation. The records are accurate and reliable, but are affected by backwater as stated above.

From high-water marks preserved at this station the following flood heights have been measured and referred to the present gage datum: 1875, gage height 33.5 feet; about year 1895, gage height 34.0 feet; 1897, gage height 34.5 feet; and 1898, gage height 36 feet. These records are authentic, but it is possible that some of the dates may be in error.

The data thus far obtained are insufficient to enable estimates of the flow to be made.

Discharge measurements of Little Wabash River at Carmi, Ill., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 10	C. T. Bailey	156	324	3.54	757
Dec. 14	Bailey and Monk	132	137	2.01	137

Daily gage height, in feet, of Little Wabash River at Carmi, Ill., for 1910.

[Noah Weigant, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.3	11.4	19.9	2.25	4.65	4.5	2.85	2.45	3.4	2.1	2.15	5.35
2	2.4	9.4	20.3	2.25	4.55	3.25	3.4	2.35	2.75	2.2	2.2	4.3
3	2.5	6.7	21.35	2.25	5.25	3.2	3.3	2.25	2.35	2.25	2.1	4.4
4	2.7	4.1	22.9	2.25	4.55	3.1	3.0	2.2	2.8	7.75	2.05	4.2
5	3.5	3.5	24.2	2.2	3.6	3.05	3.4	2.15	6.85	16.9	2.1	3.65
6	4.7	4.25	25.5	2.2	3.1	2.6	4.1	2.1	8.7	22.75	2.05	3.0
7	4.9	5.5	26.4	2.15	3.05	2.5	5.0	2.05	11.15	23.2	2.05	2.55
8	5.0	5.5	26.95	2.15	4.3	2.4	6.1	2.0	12.2	23.0	2.0	2.45
9	5.45	4.9	27.15	2.2	4.75	3.25	6.7	2.0	13.8	23.2	2.0	2.3
10	5.1	4.1	27.05	2.3	4.0	3.5	7.0	2.0	13.95	23.9	1.95	2.25
11	4.55	3.35	26.7	2.35	3.7	3.25	6.25	1.95	13.35	24.6	1.95	2.15
12	3.5	3.1	26.1	2.55	5.05	2.8	5.9	1.95	12.7	25.25	2.0	2.1
13	6.3	2.8	25.2	2.7	5.55	2.6	4.65	1.9	11.6	25.7	1.95	2.1
14	11.15	2.75	24.0	3.0	5.05	2.45	4.0	1.9	9.3	25.85	2.0	2.0
15	12.45	2.7	22.15	3.3	5.65	2.55	3.75	1.9	5.85	25.85	1.9	2.0
16	13.0	2.7	19.0	3.45	6.35	2.5	3.8	1.9	3.7	25.6	1.9	1.95
17	13.7	2.8	13.8	4.65	6.55	2.4	3.75	1.85	3.0	25.3	1.85	2.0
18	15.6	2.8	8.0	5.35	5.55	2.25	4.4	1.85	2.55	24.75	1.9	2.0
19	16.4	2.7	3.9	6.95	4.3	2.2	6.85	2.1	2.4	23.95	1.85	2.0
20	16.75	3.3	2.9	7.8	4.0	2.1	9.1	1.95	2.25	22.9	1.9	2.0
21	17.3	3.95	2.75	7.55	3.45	2.1	10.15	2.0	2.2	21.45	1.85	2.0
22	17.9	5.3	2.6	6.3	3.05	2.1	10.2	2.05	2.1	19.35	1.85	1.9
23	18.35	8.05	2.55	5.0	3.25	2.65	9.55	2.5	2.0	15.6	1.9	2.0
24	18.5	9.35	2.5	3.95	4.25	3.25	9.0	2.55	2.05	10.55	1.85	2.0
25	18.35	11.1	2.45	3.65	5.1	2.95	8.9	2.7	1.95	5.3	1.9	1.95
26	17.65	12.4	2.45	3.55	6.5	2.55	10.9	2.6	2.0	3.25	1.85	1.95
27	16.8	16.65	2.4	4.3	7.45	2.4	8.6	2.7	2.0	2.65	1.85	2.0
28	15.7	19.4	2.35	4.8	7.75	2.35	5.95	2.6	2.3	2.5	2.15	2.05
29	14.15	.....	2.35	4.85	7.65	2.3	4.0	2.35	2.25	2.35	2.95	2.3
30	13.25	.....	2.3	4.75	7.3	2.3	3.15	3.45	2.2	2.25	5.2	3.45
31	12.5	.....	2.3	.....	6.4	.....	2.75	3.9	.....	2.25	.....	5.25

NOTE.—No ice reported by observer; gage heights probably not affected by ice.

SKILLET FORK RIVER NEAR WAYNE CITY, ILL.

This station, which is located at the Southern ailway bridge, about 1 mile east of Wayne City, Ill., was established August 16, 1908.

Horse Creek enters on the right bank about 4 miles above the section. The drainage area above the gaging section is 481 square miles.

The datum of the chain gage, which is attached to the railroad bridge, has remained unchanged since its installation.

The discharge measurements made to date indicate that the section at the point of control has not changed.

The records are accurate and reliable.

Discharge measurements of Skillet Fork River near Wayne City, Ill., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 1	Jackson and McChristie	652	4,980	20.72	6,050
1-2	do	652	5,000	20.72	[a]6,470
6	H. J. Jackson	138	1,050	11.90	980
7	do	113	590	8.12	432
8	do	92	287	5.26	222
9	do	84	211	4.55	157
Dec. 17	Bailey and Monk	17	10.8	2.32	[b]2.9

[a] This measurement is a combination of measurements made on Mar. 1 and Mar. 2.
[b] Measurement not made at regular section.

Daily gage height, in feet, of Skillet Fork River at Wayne City, Ill., for 1910.

[Evert Higdon, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.3	4.0	20.6	2.55	5.3	2.6	2.3	2.4	2.1	2.35	2.75	2.75
2	2.5	3.9	20.7	2.55	3.6	2.5	2.3	2.35	2.05	2.3	2.75	2.65
3	2.55	3.7	20.4	2.7	3.1	2.5	2.3	2.2	2.1	2.3	2.7	2.55
4	3.6	3.5	19.9	2.75	4.2	2.45	2.85	2.2	3.2	13.85	2.75	2.55
5	4.0	4.5	18.9	2.65	3.5	2.4	2.7	2.2	10.05	20.3	2.75	2.5
6	5.4	5.9	14.0	3.0	3.2	2.7	2.55	2.15	13.5	20.95	2.7	2.45
7	5.8	4.4	7.6	3.0	2.9	3.2	2.9	2.15	12.65	20.7	2.7	2.45
8	5.35	3.5	5.6	2.95	4.9	3.1	2.95	2.1	11.85	20.6	2.75	2.4
9	4.3	3.25	4.55	2.9	5.3	2.9	2.95	2.05	10.0	20.65	2.75	2.45
10	3.0	3.2	3.95	2.85	4.2	2.8	3.25	2.15	13.55	11.0	2.8	2.35
11	2.7	3.2	3.7	2.8	3.7	2.55	3.65	2.1	9.0	5.05	2.8	2.35
12	2.6	3.15	3.2	2.75	3.8	2.55	6.8	2.2	5.15	3.3	2.85	2.35
13	5.8	3.1	3.1	2.8	5.6	2.5	4.4	2.2	3.15	2.95	2.85	2.3
14	17.0	3.15	3.0	2.8	5.0	2.5	2.95	2.1	2.9	2.85	2.85	2.3
15	17.7	3.1	2.95	2.7	4.7	2.5	2.8	2.15	2.65	2.8	2.8	2.25
16	16.7	4.3	2.9	2.8	3.2	2.4	2.65	2.05	2.65	2.7	2.85	2.25
17	15.7	4.7	2.8	7.15	3.0	2.4	2.65	2.05	2.55	2.7	2.8	2.25
18	16.0	5.3	2.75	5.9	2.7	2.4	11.9	2.0	2.5	2.6	2.8	2.3
19	17.9	5.8	2.7	5.25	2.5	2.35	13.05	2.1	2.45	2.6	2.9	2.35
20	17.6	6.0	2.75	4.25	2.8	2.35	9.5	2.2	2.4	2.55	2.8	2.35
21	12.9	7.2	2.7	3.85	2.7	2.3	3.45	2.2	2.4	2.6	2.85	2.3
22	10.3	10.2	2.7	3.5	2.65	2.3	3.3	2.15	2.25	2.6	2.9	2.3
23	9.8	13.6	2.65	3.1	3.1	2.25	2.9	2.15	2.25	2.55	2.85	2.3
24	5.4	11.6	2.65	3.5	9.1	2.25	2.65	2.05	2.65	2.5	2.85	2.35
25	4.7	10.3	2.65	4.5	8.1	2.25	2.6	2.2	3.05	2.6	2.85	2.35
26	4.25	7.6	2.7	4.7	5.5	2.25	2.5	2.15	3.0	2.6	2.85	2.35
27	4.8	18.6	2.7	5.8	3.9	2.25	2.45	2.15	2.65	2.65	2.85	2.35
28	5.7	20.5	2.65	6.9	3.6	2.2	2.4	2.05	2.5	2.7	2.85	2.35
29	6.0	.....	2.6	6.3	2.95	2.2	2.4	2.1	2.25	2.65	10.85	4.3
30	5.4	.....	2.6	5.8	2.8	2.25	2.5	2.05	2.4	2.75	5.25	7.1
31	4.6	.....	2.55	.....	2.7	.....	2.4	2.1	.....	2.7	.....	5.0

NOTE.—No ice reported by observer; relation of gage height to discharge probably not affected by ice.

50017°—WSP 283—12——8

Daily discharge, in second-feet, of Skillet Fork River at Wayne City, Ill., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3	115	6,420	12	212	14	3	5	0.5	4	22	22
2	9	107	6,530	12	85	9	3	4	.4	3	22	16
3	12	92	6,220	19	47	9	3	1	.5	3	19	12
4	85	77	5,700	22	130	7	28	1	55	1,750	22	12
5	115	152	4,700	16	77	5	19	1	769	6,110	22	9
6	220	257	1,810	40	55	19	12	.8	1,630	6,800	19	7
7	250	145	431	40	32	55	32	.8	1,360	6,530	19	7
8	216	77	235	36	182	47	36	.5	1,140	6,420	22	5
9	137	58	156	32	212	32	36	.4	760	6,480	22	7
10	40	55	111	28	130	25	58	.8	1,650	950	25	4
11	19	55	92	25	92	12	88	.5	600	194	25	4
12	14	51	55	22	100	12	343	1	201	62	28	4
13	250	47	47	25	235	9	145	1	51	36	28	3
14	3,250	51	40	25	190	9	36	.5	32	28	28	3
15	3,710	47	36	19	167	9	25	.8	16	25	25	2
16	3,080	137	32	25	55	5	16	.4	16	19	28	2
17	2,550	167	25	382	40	5	16	.4	12	19	25	2
18	2,700	212	22	257	19	5	1,160	.3	9	14	25	3
19	3,860	250	19	208	9	4	1,480	.5	7	14	32	4
20	3,640	265	22	134	25	4	678	1	5	12	25	4
21	1,430	387	19	104	19	3	74	1	5	14	28	3
22	814	796	19	77	16	3	62	.8	2	14	32	3
23	726	1,660	16	47	47	2	32	.8	2	12	28	3
24	220	1,080	16	77	614	2	16	.4	16	9	28	4
25	167	814	16	152	487	2	14	1	44	14	28	4
26	134	431	19	167	227	2	9	.8	40	14	28	4
27	175	4,440	19	250	107	2	7	.8	16	16	28	4
28	242	6,320	16	354	85	1	5	.4	9	19	28	4
29	265	.....	14	293	36	1	5	.5	2	16	920	137
30	220	.....	14	250	25	2	9	.4	5	22	208	376
31	160	.....	12	.....	19	.....	5	.5	.....	19	.....	190

NOTE.—Daily discharge determined by means of a discharge rating curve fairly well defined between 1.0 and 1,180 second-feet (gage heights 2.2 and 12.0 feet), and poorly defined above 1,180 second-feet (gage height 12.0 feet). Above 14 second-feet (gage height 2.6 feet) this discharge rating curve coincides with the 1909 curve, but below 14 second-feet (gage height 2.6 feet) the curve was revised by means of recent discharge measurements. Because of the change in the rating curve daily discharge figures differ from those published by the Internal Improvement Commission of Illinois in its report for 1908–1910.

Monthly discharge of Skillet Fork River near Wayne City, Ill., for 1910.

[Drainage area, 481 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	3,860	3	926	1.93	2.22	B.
February	6,320	47	655	1.36	1.42	B.
March	6,530	12	1,060	2.20	2.54	B.
April	382	12	105	.218	.24	B.
May	614	9	122	.254	.29	B.
June	55	1	10.5	.022	.02	D.
July	1,480	3	144	.299	.34	B.
August	5	.3	.94	.0020	.002	D.
September	1,650	.4	282	.586	.65	B.
October	6,800	3	1,150	2.39	2.76	B.
November	920	19	61.3	.127	.14	B.
December	376	2	27.9	.058	.07	C.
The year	6,800	.3	379	.788	10.69	

NOTE.—Monthly discharge differs from that published by the Internal Improvement Commission of Illinois because of revision of discharge rating curve.

SKILLET FORK RIVER NEAR MILL SHOALS, ILL.

This station, which is located at the Baltimore & Ohio Southwestern Railroad bridge about 1 mile south of Mill Shoals, Ill., was established October 9, 1908.

Griffin Creek joins the river on the left bank about 1½ miles above the station, and Haw Creek enters on the right bank about 5 miles above the station. The drainage area above the gaging section is 912 square miles.

The datum of the chain gage, attached to the railroad bridge, has remained unchanged since its installation, and the records are accurate and reliable. There is but one channel at all stages, and the entire flood discharge can be measured at the regular section.

Backwater occurs at this station, and reliable estimates of the daily discharge can not be made with the data at present available.

Discharge measurements of Skillet Fork River near Mill Shoals, Ill., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 1	Jackson and McChristie	791	3,400	19.65	3,440
3	H. J. Jackson	1,060	5,860	22.12	5,460
5	do	1,067	7,010	23.11	5,640
8	do	1,063	6,630	22.82	4,330
10	do	1,058	5,500	21.80	3,380
12	do	1,031	4,120	20.45	2,280
14	do	141	1,450	18.03	1,440
15	do	124	1,110	15.46	935
16	do	91	660	11.43	519
17	do	70	325	7.50	216
18	do	59	150	4.70	117
Dec. 14	Bailey and Monk	36	25.3	2.29	[a] 10.8

[a] Relation of gage height to discharge slightly affected by ice.

Daily gage height, in feet, of Skillet Fork River near Mill Shoals, Ill., for 1910.

[John A. Clow, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.1	5.5	19.8	2.8	6.2	3.1	1.7	3.6	1.65	2.45	3.0	5.8
2	3.3	5.0	21.2	2.7	5.4	2.9	1.7	3.5	1.65	2.4	2.85	4.05
3	3.4	4.8	22.3	2.7	5.0	2.6	1.8	3.15	1.7	2.35	2.85	2.95
4	3.4	4.8	22.9	2.6	4.5	2.5	2.9	2.8	2.75	13.75	2.75	2.95
5	4.1	5.4	23.3	2.5	4.4	2.5	4.9	2.55	9.6	18.4	2.75	2.75
6	5.0	6.0	23.4	2.6	4.4	2.4	3.85	2.0	14.35	19.95	2.5	2.8
7	6.5	6.0	22.9	2.6	4.4	2.2	3.8	2.0	15.35	22.2	2.45	2.65
8	7.0	5.8	22.7	2.8	4.3	3.1	3.5	1.85	15.9	23.35	2.35	2.65
9	6.9	4.9	22.2	3.5	4.2	3.5	3.35	1.9	16.65	24.15	2.25	2.65
10	6.8	4.4	21.6	3.4	4.4	3.7	3.0	1.75	16.3	24.3	2.15	2.65
11	5.0	4.3	21.0	3.3	4.6	3.6	2.85	1.8	15.85	24.25	2.2	2.4
12	4.2	4.0	20.4	3.3	5.5	3.0	3.8	1.7	13.75	23.9	2.15	2.35
13	11.4	4.0	19.6	3.7	6.0	2.9	4.5	1.55	11.8	23.65	1.95	2.25
14	13.5	3.9	17.5	4.05	6.4	2.6	5.25	1.6	7.85	23.35	1.85	2.15
15	14.9	3.9	14.8	4.4	6.0	2.4	4.8	1.55	5.15	23.1	1.85	2.2
16	15.4	4.7	10.7	4.7	5.3	2.3	3.85	1.6	4.8	22.35	1.9	2.2
17	16.3	4.5	6.0	8.4	4.5	2.3	4.8	1.5	3.65	21.8	1.85	2.1
18	16.5	5.1	4.3	9.5	4.2	2.2	7.5	1.65	3.3	21.05	1.75	2.1
19	16.9	5.4	3.8	9.0	3.9	2.0	9.85	1.7	2.95	21.8	1.75	2.0
20	17.3	5.6	3.8	8.3	3.6	1.9	10.2	1.65	2.55	21.25	1.75	2.0

Daily gage height, in feet, of Skillet Fork River near Mill Shoals, Ill., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	17.3	7.1	3.4	7.0	3.4	1.8	10.65	1.6	2.6	19.95	1.8	2.1
22	16.9	9.2	3.4	6.5	3.2	1.7	8.9	5.1	2.35	19.3	1.65	2.1
23	15.7	13.4	3.3	6.3	7.2	1.7	4.5	4.05	2.4	13.35	1.65	2.2
24	15.3	14.4	3.2	6.0	8.1	1.6	4.25	3.0	2.35	9.45	1.65	2.2
25	11.3	14.3	3.2	5.9	9.3	1.6	4.1	2.55	2.45	5.85	1.65	2.2
26	8.6	13.5	3.2	5.65	9.3	1.6	4.15	1.9	3.0	4.55	1.6	2.2
27	7.7	17.4	3.2	6.9	7.1	1.6	4.3	1.8	4.45	3.5	1.55	2.2
28	7.0	19.3	3.1	7.8	5.0	1.5	4.4	1.75	3.0	3.15	5.75	2.6
29	6.8	.....	2.9	7.6	4.5	1.6	4.15	1.8	2.95	2.95	9.15	4.1
30	6.6	.....	2.8	7.0	4.0	1.6	4.0	1.75	2.85	2.95	7.75	8.2
31	6.2	.....	2.8	.....	3.5	.....	3.85	1.8	.....	2.95	.....	9.6

NOTE.—Relation of gage height to discharge probably affected by ice about Jan. 1 to 14 and Dec. 8 to 24. Gage read to top of ice Jan. 7, 12, 13, and 14.

TENNESSEE RIVER BASIN.

GENERAL FEATURES.[1]

Tennessee River gathers its waters from seven States—Virginia, North Carolina, Georgia, Tennessee, Alabama, Mississippi, and Kentucky. Its drainage area comprises about 39,000 square miles, and its extreme range discharge to the present time has been estimated at about 650,000 second-feet for flood stages and about 8,000 second-feet for low stages.

The exact point at which Tennessee River begins was long a matter of uncertainty. Rivière des Cheraquis, or Cherake, of the early French explorers, and Cherokee River, as referred to in cessions to the English by the Indians in 1767, has been considered as being formed by the junction of what are now called Little Tennessee and Holston rivers, near the town of Lenoirs, Tenn. Tannassee, the chief town of the Cherokee Indians, was situated near this point, and the fact that the river derives its present name from that town seems to add weight to the arguments of the geographers who have placed the headwaters of the river at this junction. In some of the older geographies the head of this river has been placed at the mouth of Clinch River.

The legislature of the State of Tennessee in 1889 passed an act declaring "that the Tennessee extends from its junction with the Ohio River at Paducah, in the State of Kentucky, past the Clinch and French Broad rivers, to the junction of the north fork of the Holston River with the Holston at Kingsport, in Sullivan County, Tenn., all usages to the contrary notwithstanding."

Congressional legislation in several laws appropriating money for the improvement of the upper Tennessee between Knoxville and Chattanooga has given authority for extending the name at least to the former city. In the river and harbor act of 1890 the head of Tennessee River appears to have been definitely fixed by the specific

[1] Description abstracted in part from Rept. Chief Engineers, U. S. Army, 1893, pt. 3, p. 2330; 1897, pt. 3, pp. 2247, 2249, 2250.

language of the act providing for a survey of Tennessee River from Chattanooga to the junction of Holston and French Broad rivers.

The Tennessee is, therefore, here considered as beginning at the junction of French Broad and Holston rivers, which are designated headwater tributaries; and in determining the order in which the various tributaries and their gaging stations are described, the French Broad is regarded as the main stream.

The French Broad, the largest tributary stream in the system, heads in the Blue Ridge Mountains in Transylvania County, N. C., where the mountain peaks and ridges rise more than 5,000 feet above sea level. The headwater creeks descend very rapidly until they reach an elevation of about 2,200 feet at a point above Brevard, N. C., below which the river, though yet quite small, flows with a smooth current through a flat valley of considerable width for some 50 miles to the vicinity of Asheville, N. C. Among the tributaries entering this stretch of the French Broad are Davidsons and Mills rivers, both of which are small, rapid streams flowing southeastward from the highest mountains in this part of the drainage area, the Pisgah Ridge with its numerous knobs and peaks. Excepting the cultivated districts in the immediate river valley, this part of the area is largely in forest land, much of which, especially in the basins of Davidsons and Mills rivers, lies in the forest reserves of the Biltmore estates.

The river flows at first northeastward, but its course becomes nearly due north before it reaches Asheville; below Asheville, where its general course is northwestward, at right angles to the mountain ridges, it descends rapidly from an extensive plateau region in the midst of the Appalachian Mountains, cutting through the Unaka Mountains, which form its northwestern rim, and passing to the Appalachian Valley. The river channel is narrow and canyon like, with steep, rocky bluffs which give a very rugged appearance to the adjacent country when viewed from the river, although it is really a broad, elevated basin, comparatively smooth and mostly cleared and in cultivation. Further down in the vicinity of the North Carolina-Tennessee State line, where the mountain ranges are higher, and up the tributary streams a long way from the river, the area is mostly forested.

Opportunities for water-power development on the French Broad are very great, the fall in the river from Asheville down to the State line being 800 feet in 45 miles. Special engineering problems would have to be solved, however, in making developments, as the tracks of the Southern Railway lie along the river, usually just above the water's edge, for its entire length.

For the remainder of its course, about 90 miles in length, the French Broad has a much flatter grade and flows through a valley which

widens rapidly into the broad agricultural valley of the upper Tennessee and Holston rivers.

Tennessee River, below the junction of its headwater tributaries, flows southwestward, crossing into Alabama about 40 miles below Chattanooga, Tenn. At Gunthersville, Ala., it turns almost a right angle and flows northwestward past the corner of Mississippi into Tennessee for the second time, then almost due north across the State, emptying into Ohio River at Paducah, about 40 miles above Cairo.

French Broad River has at its mouth a drainage area comprising 4,800 square miles. The Holston is somewhat smaller, having 3,750 square miles of drainage area. Fifty miles below, in Loudon County, Tenn., Little Tennessee River contributes its area of 2,650 square miles, and at Kingston, 30 miles farther down, the Clinch, with its nearly 4,400 square miles of drainage area, is added. Hiwassee River, having about 2,700 square miles of basin, enters 50 miles below the mouth of the Clinch, and is the last of the five large tributaries which combine to make up a great river within the comparatively short distance of 130 miles. Indeed, with the exception of Duck River, with between 3,000 and 4,000 square miles of area, which enters the lower portion of the Tennessee 100 miles above its mouth, all other tributaries in the 500 miles of length below the Hiwassee are comparatively small.

Pigeon River, the first large tributary of French Broad River, rises among the Balsam and Pisgah mountains, cuts its way through the Great Smoky Mountains, thus passing to the Appalachian Valley, and joins the French Broad a short distance below Newport, Tenn. It drains an interior agricultural basin which is oval in outline, the longer axis northwest, parallel to the general course of the stream and almost entirely within the Appalachian Mountain region. It is circumscribed by lofty mountains, with many peaks more than 6,000 feet in altitude. Many minor ranges springing from the surrounding mountains converge toward the middle of the basin, dividing it into deep, narrow valleys except near its upper end between the towns of Canton and Waynesville, where there is a broad open valley of alluvial plains and rolling hills, dotted with low mountains. The basin has an area of about 667 square miles.

Nolichucky River, the second large tributary of French Broad River, is formed by the junction of Toe and Caney rivers about 8 or 9 miles east of the Tennessee State line. The river flows almost due north for several miles, then turns toward the northwest and flows in a deep gorge through the Unaka Mountains into Tennessee near Embreville, where, preserving its general westerly direction, it finally enters the French Broad about 7½ miles southeast of Morristown and about 5 miles below the mouth of Pigeon River. Its tributaries, like the main stream, rise near the summits of mountain chains and flow

over rocky and precipitous beds through narrow valleys. The total fall of the river between the junction of the North and South Toe and Embreville is about 850 feet, in a distance following the course of the river of about 40 miles. The whole area is subject to sudden and violent rains, producing great floods. The rainfall over the basin is about 51.0 inches per annum.

The rocks of the upper portion of the drainage basins of French Broad River and other eastern tributaries heading in the Appalachian Mountains include the older granites, quartzites, conglomerate schists, shales, and sandstones.

The Cumberland Plateau, drained in part by Clinch River and other western tributaries of the Tennessee and crossed by Tennessee River below Chattanooga, comprises widespread beds of limestone and extensive deposits of coal.

Tennessee River has always held an important place in the projects for the improvement of the navigable waterways of the country. The Muscle Shoals Canal having been opened to navigation, the river is now navigable from its mouth for a distance of 673 miles during several months of the year, and as work is continued upon other less formidable obstructions the season of navigation will be correspondingly lengthened. The river channel, especially at low stages, is mainly a succession of pools of comparatively deep water with smooth surfaces separated by bars or ledges where most of the fall is concentrated. These ridges, many of which are solid rock ledges, are usually at the wider parts of the river channel, and are the obstructions to low-water navigation, causing shallow and swift water at such stages. The radical improvement of this river, so as to make navigation continuous throughout its length for boats of moderate draft, is by no means impossible.

In connection with navigation projects a large amount of water power can be developed. The greatest water power possibilities, however, are at Muscle Shoals and other shoals near Florence, Ala.

The following special reports contain information regarding the hydrography of the Tennessee River basin:

Water power in North Carolina: Bull. North Carolina Geol. Survey No. 8 (postage 16c.).

Water powers of North Carolina: Bull. North Carolina Geol. Survey No. 20. Dr. J. H. Pratt, State geologist, Chapel Hill, N. C. This report contains all records of discharge collected in the Tennessee River basin in North Carolina prior to 1908 by engineers of the U. S. Geological Survey.

Water resources of Georgia, by B. M. and M. R. Hall: Water-Supply Paper U. S. Geol. Survey No. 197. Contains data on stream flow, water power, and river surveys collected in the Tennessee basin in Georgia prior to 1906.

Water powers of Alabama, by B. M. Hall: Water-Supply Paper U. S. Geol. Survey No. 107. Contains data on stream flow collected in the Tennessee basin in Alabama prior to 1904.

Hydrography of the southern Appalachian Mountain region, Parts 1 and 2, by H. A. Pressey: Water-Supply Papers U. S. Geol. Survey Nos. 62 and 63. The Geological Survey has no copies of these papers for free distribution, but they may be consulted at libraries or may be purchased from the Superintendent of Documents, Washington, D. C., for 15 cents each.

River surveys and profiles made during 1903, arranged by W. C. Hall and J. C. Hoyt: Water-Supply Paper U. S. Geol. Survey No. 115.

Relation of southern Appalachian Mountains to the development of inland water navigation and water power: U. S. Forest Service circulars Nos. 143 and 144.

STATIONS ON FRENCH BROAD AND MAIN TENNESSEE RIVERS.

FRENCH BROAD RIVER AT ASHEVILLE, N. C.

This station is located at the steel highway bridge known as Smith's Bridge, about 1 mile below the Southern Railway depot at Asheville. This bridge is about a quarter of a mile above the new Southern Railway bridge and about a quarter of a mile below a new concrete highway bridge. It is about 2 miles below the mouth of Swannanoa River. The total drainage area above the station is 987 square miles,

The United States Weather Bureau maintains a station at this place, and during 1904 the United States Geological Survey made a number of discharge measurements. Since the beginning of 1905 the discharge measurements have been continued at the bridge by the United States Geological Survey and the gage heights have been furnished by the United States Weather Bureau.

The United States Weather Bureau gage is a heavy vertical timber securely bolted to a bridge pier. The gage terminates at zero on a stone shelf projection. An auxiliary chain gage is located on the bridge at about the same point. It is set to read the same as the staff gage and used only for minus readings. Discharge measurements are made from the downstream side of the bridge. The conditions of flow are favorable for accurate results.

The discharge at this station was not affected by any artificial control until 1907, when a new railroad bridge was constructed across the river about 1,500 feet below the gage. Measurements made since 1907 indicate that the conditions of flow have been changed.

Discharge measurements of French Broad River at Asheville, N. C., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Nov. 18	M. R. Hall	302	694	−0.46	960
19	do	302	725	−0.36	1,044

Daily gage height, in feet, of French Broad River at Asheville, N. C., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.4	0.1	2.7	0.0	−0.3	0.1	0.2	0.1	7.9	0.1	−0.4	−0.4
2	.2	.1	2.9	.0	− .3	.1	.2	.2	5.5	.1	− .4	− .4
3	.1	.0	2.0	.1	− .3	.1	.3	.9	4.6	.0	− .2	− .4
4	.1	.0	1.4	.0	− .3	.0	.4	.3	2.8	.0	− .2	− .5
5	.1	.0	1.1	.0	− .3	.0	.7	.2	2.2	− .2	− .3	− .5
6	.0	.0	.9	− .1	− .2	.5	1.1	.1	1.6	− .3	− .4	1.7
7	2.0	.0	.8	− .1	− .2	.2	.8	.5	1.3	.8	− .4	1.1
8	1.5	− .1	.4	− .1	2.5	.0	2.0	1.1	1.0	1.3	− .4	.2
9	.6	− .1	.4	.0	3.2	.0	1.3	.3	.7	1.9	− .4	.0
10	.4	− .1	.3	− .1	2.5	.0	2.3	.1	.7	1.3	− .4	− .1
11	.3	− .1	.5	− .2	1.2	.3	2.2	.1	.4	.5	− .4	− .2
12	.2	.0	.7	− .2	.8	.4	1.1	.0	.3	.2	− .4	− .2
13	.1	.0	.5	− .2	.5	.8	1.0	.2	.4	.2	− .4	− .2
14	.1	.0	.3	− .2	.4	2.0	1.3	− .2	.3	.1	− .4	− .4
15	.1	.0	.3	− .2	.3	1.9	1.3	− .3	.2	.0	− .4	− .4
16	.1	.1	.3	− .2	.2	1.1	1.1	− .3	.2	.0	− .4	− .4
17	.1	.9	.3	.5	.2	.8	.7	− .4	.1	.0	− .4	− .4
18	.1	2.7	.2	.8	.3	.5	.6	− .4	.1	.0	− .4	− .4
19	.2	1.9	.2	.6	.5	.3	.4	− .4	.0	.0	− .4	− .3
20	.1	1.2	.2	.3	.3	.3	.3	− .3	.0	.1	− .4	− .3
21	.3	.8	.2	.3	.5	.5	.2	− .4	.0	.0	− .4	− .3
22	1.1	1.0	.1	.1	.5	.3	.2	.0	.0	.0	− .4	− .5
23	.5	.8	.2	.0	.4	.4	.1	.0	.0	− .2	− .4	− .5
24	.3	.6	.2	.0	.3	.4	.1	− .1	.0	− .2	− .4	1.3
25	.2	.4	.2	.0	1.1	.4	.0	− .2	.4	− .3	− .4	.7
26	.2	.3	.0	.2	1.1	.2	.0	.1	.3	− .3	− .4	.2
27	.1	.8	.1	.1	.7	.1	.4	.0	.5	− .3	− .4	.0
28	.1	1.5	.0	.0	.5	.0	.3	− .2	.5	− .3	− .4	.0
29	.2	.....	.0	.0	.3	.3	.2	− .3	.1	− .3	− .4	− .1
30	.2	.....	.0	− .1	.3	.2	.1	− .3	.5	− .4	− .4	.1
31	.2	.....	.0	.....	.2	.....	.2	8.8	.....	− .4	.....	.5

NOTE.—Relation of gage height to discharge probably not affected by ice.

Daily discharge, in second-feet, of French Broad River at Asheville, N. C., for 1909–1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	2,190	1,820	2,750	2,750	7,690	3,410	3,770	2,600	1,290	1,490	1,190	1,100
2	2,060	1,710	2,460	2,600	6,640	3,240	4,350	2,910	1,290	1,490	1,190	1,100
3	1,940	1,710	2,460	2,600	4,150	3,960	3,590	2,320	1,290	1,390	1,190	1,100
4	1,820	1,600	2,460	2,460	3,240	15,200	3,590	2,750	1,290	1,390	1,190	1,010
5	3,240	1,600	2,320	2,320	2,910	11,400	2,750	2,320	1,390	1,190	1,190	1,010
6	4,980	1,820	2,460	2,190	2,750	10,200	2,910	2,060	1,290	1,190	1,190	1,010
7	3,410	1,820	2,910	2,190	2,600	8,230	3,240	1,940	1,290	1,190	1,190	1,290
8	2,600	1,940	2,600	2,190	2,320	4,980	4,350	1,820	1,290	1,190	1,190	1,600
9	2,320	1,820	2,460	2,190	1,940	4,760	4,350	1,600	1,290	1,190	1,190	2,320
10	2,060	3,240	4,980	2,320	10,800	7,690	4,350	1,490	1,600	1,290	1,100	1,600
11	1,940	3,590	4,550	2,060	5,660	6,640	3,770	1,710	1,490	2,600	1,190	1,390
12	1,820	2,750	3,410	1,940	3,590	4,350	3,240	1,710	1,190	2,190	1,190	1,290
13	1,820	2,320	3,240	2,060	2,910	5,660	2,600	2,060	1,190	1,600	1,190	2,910
14	1,710	2,060	5,430	4,350	2,600	4,980	3,960	2,460	1,190	1,940	1,190	7,960
15	1,940	1,940	4,550	3,410	2,460	5,900	4,150	2,190	1,190	2,750	1,190	7,690
16	2,060	3,410	3,590	2,750	2,460	4,980	3,240	4,150	1,490	2,460	1,190	3,410
17	3,960	3,770	3,240	2,460	2,320	6,140	2,910	3,770	2,460	1,940	1,190	2,600
18	3,070	2,750	2,750	2,320	2,190	4,980	2,600	2,600	1,940	1,490	1,190	2,190
19	2,600	4,150	2,600	2,190	2,060	3,770	2,320	2,060	1,940	1,290	1,190	1,940
20	2,190	3,590	2,750	2,060	3,590	8,230	2,190	1,820	1,710	1,390	1,190	1,820
21	2,060	2,460	2,600	1,940	10,800	8,230	2,060	1,710	1,600	1,390	1,190	1,710
22	1,940	2,910	2,750	1,940	7,960	3,960	1,940	1,710	1,940	1,390	1,190	1,600
23	1,710	4,550	2,460	2,060	8,230	3,960	2,190	1,600	6,640	1,290	1,190	1,490
24	1,710	5,900	2,320	2,600	5,660	4,760	2,060	1,600	4,350	1,290	1,190	1,390
25	1,710	6,140	5,660	2,190	4,350	3,770	1,940	1,490	2,600	1,290	1,190	1,710
26	1,710	4,550	6,140	2,060	3,960	3,770	1,710	1,390	2,320	1,290	1,190	1,600
27	1,710	3,770	3,960	1,940	3,960	3,410	2,060	1,390	1,940	1,190	1,190	1,600
28	1,600	3,240	4,980	1,940	3,410	4,150	3,410	1,390	1,820	1,190	1,100	1,600
29	1,600	.....	4,350	1,820	2,910	4,550	2,320	1,490	1,820	1,190	1,100	1,600
30	1,600	.....	3,590	1,710	3,070	3,960	2,060	1,390	1,710	1,190	1,100	1,390
31	1,940	.....	3,240	.....	3,070	.....	2,910	1,290	.....	1,190	.....	1,290

Daily discharge, in second-feet, of French Broad River at Asheville, N. C., for 1909–1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	1,820	1,490	5,900	1,390	1,100	1,490	1,600	1,490	21,900	1,490	1,010	1,010
2	1,600	1,490	6,390	1,390	1,100	1,490	1,600	1,600	14,000	1,490	1,010	1,010
3	1,490	1,390	4,350	1,490	1,100	1,490	1,710	2,460	11,100	1,390	1,190	1,010
4	1,490	1,390	3,240	1,390	1,100	1,390	1,820	1,710	6,140	1,390	1,190	920
5	1,490	1,390	2,750	1,390	1,100	1,390	2,190	1,600	4,760	1,190	1,100	920
6	1,390	1,390	2,460	1,290	1,190	1,940	2,750	1,490	3,590	1,100	1,010	3,770
7	4,350	1,390	2,320	1,290	1,190	1,600	2,320	1,940	3,070	2,320	1,010	2,750
8	3,410	1,290	1,820	1,290	5,430	1,390	4,350	2,750	2,600	3,070	1,010	1,600
9	2,060	1,290	1,820	1,390	7,160	1,390	3,070	1,710	2,190	4,150	1,010	1,390
10	1,820	1,290	1,710	1,290	5,430	1,390	4,980	1,490	2,190	3,070	1,010	1,290
11	1,710	1,290	1,940	1,190	2,910	1,710	4,760	1,490	1,820	1,940	1,010	1,190
12	1,600	1,390	2,190	1,190	2,320	1,820	2,750	1,390	1,710	1,600	1,010	1,190
13	1,490	1,390	1,940	1,190	1,940	2,320	2,600	1,600	1,820	1,600	1,010	1,190
14	1,490	1,390	1,710	1,190	1,820	4,350	3,070	1,190	1,710	1,490	1,010	1,010
15	1,490	1,390	1,710	1,190	1,710	4,150	3,070	1,100	1,600	1,390	1,010	1,010
16	1,490	1,490	1,710	1,190	1,600	2,750	2,750	1,100	1,600	1,390	1,010	1,010
17	1,490	2,460	1,710	1,940	1,600	2,320	2,190	1,010	1,490	1,390	1,010	1,010
18	1,490	5,900	1,600	2,320	1,710	1,940	2,060	1,010	1,490	1,390	1,010	1,010
19	1,600	4,150	1,600	2,060	1,940	1,710	1,820	1,010	1,390	1,390	1,010	1,100
20	1,490	2,910	1,600	1,710	1,710	1,710	1,710	1,100	1,390	1,490	1,010	1,100
21	1,710	2,320	1,600	1,710	1,940	1,940	1,600	1,010	1,390	1,390	1,010	1,100
22	2,750	2,600	1,490	1,490	1,940	1,710	1,600	1,390	1,390	1,390	1,010	920
23	1,940	2,320	1,600	1,390	1,820	1,820	1,490	1,390	1,390	1,190	1,010	920
24	1,710	2,060	1,600	1,390	1,710	1,820	1,490	1,290	1,390	1,190	1,010	3,070
25	1,600	1,820	1,600	1,390	2,750	1,820	1,390	1,190	1,820	1,100	1,010	2,190
26	1,600	1,710	1,390	1,600	2,750	1,600	1,390	1,490	1,710	1,100	1,010	1,600
27	1,490	2,320	1,490	1,490	2,190	1,490	1,820	1,390	1,940	1,100	1,010	1,390
28	1,490	3,410	1,390	1,390	1,940	1,390	1,710	1,190	1,940	1,100	1,010	1,390
29	1,600	.....	1,390	1,390	1,710	1,710	1,600	1,100	1,490	1,100	1,010	1,290
30	1,600	.....	1,390	1,290	1,710	1,600	1,490	1,100	1,940	1,010	1,010	1,490
31	1,600	.....	1,390	.....	1,600	.....	1,600	25,100	.....	1,010	.....	1,940

NOTE.—Daily discharge determined by means of a discharge rating curve, well defined between 920 and 10,800 second-feet (gage heights, —0.5 and 4.5 feet).

Monthly discharge of French Broad River at Asheville, N. C., for 1909–1910.

[Drainage area, 987 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum	Minimum.	Mean.	Per square mile.		
1909.						
January	4,980	1,600	2,230	2.26	2.61	B.
February	6,140	1,600	2,960	3.00	3.12	A.
March	6,140	2,320	3,420	3.47	4.00	A.
April	4,350	1,710	2,320	2.35	2.62	A.
May	10,800	1,940	4,270	4.33	4.99	A.
June	15,200	3,240	5,770	5.85	6.53	A.
July	4,350	1,710	3,000	3.04	3.50	A.
August	4,150	1,290	2,030	2.06	2.38	A.
September	6,640	1,190	1,860	1.88	2.10	A.
October	2,750	1,190	1,500	1.52	1.75	B.
November	1,190	1,100	1,180	1.20	1.34	B.
December	7,960	1,010	2,040	2.07	2.39	A.
The year	15,200	1,010	2,710	2.75	37.33	
1910.						
January	4,350	1,390	1,790	1.81	2.09	B.
February	5,900	1,290	2,000	2.03	2.11	A.
March	6,390	1,390	2,150	2.18	2.51	A.
April	2,320	1,190	1,440	1.46	1.63	B.
May	7,160	1,100	2,170	2.20	2.54	A.
June	4,350	1,390	1,890	1.91	2.13	A.
July	4,980	1,390	2,270	2.30	2.65	A.
August	25,100	1,010	2,190	2.22	2.56	C.
September	21,900	1,390	3,470	3.52	3.93	B.
October	4,150	1,010	1,560	1.58	1.82	A.
November	1,190	1,010	1,020	1.03	1.15	A.
December	3,770	920	1,410	1.43	1.65	A.
The year	25,100	920	1,950	1.98	26.77	

TENNESSEE RIVER AT KNOXVILLE, TENN.

This station is located at the Gay Street or county highway bridge in the city of Knoxville, Tenn., and is about 4 miles below the junction of French Broad and Holston rivers.

Daily records are kept by the United States Weather Bureau and are furnished to the United States Geological Survey. Since 1899 discharge measurements have been made by the United States Geological Survey.

Gage heights up to 1899 were made from a staff gage at the old Gay Street Bridge. When this bridge was rebuilt, the gage was moved to a temporary location at the Knoxville & Augusta Railroad bridge, one-half mile below, and was used during the greater part of 1899. On November, 1899, readings were begun from a new staff gage located on the right bank, just below the mouth of West Knoxville Bayou, about 1,000 feet below the temporary gage. These gages were at different datums, but the latter gage was set to read the same as the original gage.

The new staff gage, which was used continuously until December 31, 1908, was located near the foot of a series of rapids, just above a long stretch of deep smooth water. Since January 1, 1909, a new staff gage attached to the bridge pier at Gay Street has been used. Although it was set to read with the old gage at low stages, the readings vary considerably, as rising water brings the beginning of the pool above the old gage. Comparative readings of the two gages have been made by the United States Weather Bureau to determine the relation between them at all stages, and this relation has been used to adjust the old rating curve to the new location of the gage. The derived curve shows a pronounced reversal between the gage heights 2 and 7 feet. Above 7 feet it again becomes approximately parallel to the old 1907–8 curve.

The measurements which have been made and referred to the new gage agree well with the derived curve.

No discharge measurements were made at this station during 1910. The station was last inspected September 16, 1909, and estimates of discharge since that date, published in Water-Supply Paper 263, page 130, should be used with caution. Estimates of daily and monthly discharge for 1910 are withheld from publication pending an investigation of a possible change in the relation of gage height to discharge at low stages since September 16, 1909.

Daily gage height, in feet, of Tennessee River at Knoxville, Tenn., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.2	2.0	4.3	0.8	1.5	2.0	1.6	2.8	8.1	1.4	0.3	1.1
2	.2	1.8	5.5	.8	1.3	1.7	1.6	2.2	8.1	1.2	.2	1.1
3	1.0	1.6	5.2	.8	1.2	1.6	1.5	1.8	5.2	.9	.2	1.0
4	.9	1.6	4.1	.7	1.1	1.5	1.5	2.2	4.4	.8	.2	1.0
5	.9	2.2	3.3	.7	1.0	1.5	1.5	2.5	3.5	.6	.0	.5
6	1.4	2.2	2.9	.7	1.0	2.2	2.3	2.4	3.8	.5	.2	4.8
7	2.2	2.2	2.7	.7	1.0	2.6	3.8	2.1	3.1	.5	.0	4.9
8	3.4	2.0	2.5	.7	1.8	2.5	4.1	2.3	2.7	.5	.0	5.4
9	4.1	1.7	2.3	.7	2.3	2.3	5.0	3.1	2.7	1.6	.0	3.2
10	2.9	1.5	2.1	.7	4.0	1.8	4.9	2.6	3.3	1.8	.0	2.3
11	2.2	1.5	2.2	.5	3.4	1.7	4.4	2.2	2.4	1.8	.0	1.9
12	1.8	1.7	2.1	.5	2.6	1.8	2.9	1.7	2.4	1.5	.0	1.6
13	1.6	1.8	2.1	1.0	2.3	1.8	2.7	1.6	2.0	1.0	.0	1.4
14	1.4	1.4	2.1	.9	2.3	2.1	2.7	1.6	1.6	1.0	−.2	1.2
15	1.4	1.3	2.0	.8	2.1	3.5	3.9	1.5	1.5	.8	−.3	1.1
16	1.4	1.2	1.8	1.1	2.0	3.7	3.1	1.3	1.5	.7	−.3	1.0
17	1.2	1.8	1.7	1.5	1.9	3.5	2.8	1.1	1.4	.4	−.5	1.0
18	1.1	3.5	1.5	2.0	2.0	3.0	2.6	.9	1.3	.2	−.6	.9
19	.8	5.5	1.5	2.2	2.1	3.0	2.3	.9	1.2	.3	−.6	1.1
20	2.5	5.4	1.2	2.1	2.1	2.5	2.3	.8	1.2	.3	−.6	.6
21	2.8	3.8	1.2	2.0	2.1	2.2	2.0	1.8	1.1	.3	−.6	.5
22	3.4	3.5	1.2	1.8	2.1	2.1	2.0	1.4	1.0	.6	−.7	.7
23	4.4	3.5	1.2	1.8	2.0	2.0	1.8	1.3	.9	.6	−.7	.6
24	3.5	3.1	1.2	1.8	2.1	2.0	1.8	1.1	.9	.6	−.7	.6
25	2.7	2.8	1.1	1.5	2.5	2.0	1.6	1.0	.9	.4	−.2	1.0
26	2.4	2.3	1.1	1.9	4.3	2.0	1.4	.9	1.0	.3	.0	1.8
27	2.2	2.3	1.0	1.5	4.1	2.1	1.3	.9	1.2	.2	−.1	1.8
28	2.0	2.1	1.0	2.0	3.1	1.8	1.7	.9	1.0	.2	.1	1.5
29	2.0	.....	1.0	1.8	2.4	1.6	2.1	1.0	.9	.2	.5	1.0
30	1.9	.....	.9	1.7	2.5	1.3	3.1	1.0	1.2	.1	1.0	.9
31	2.0	.....	.9	.....	2.3	.....	4.2	1.0	.....	.3	.....	2.0

NOTE.—Gage heights probably not affected by ice.

TENNESSEE RIVER AT CHATTANOOGA, TENN.

This station is located at the Hamilton County highway bridge in the city of Chattanooga, Tenn.

The gage, consisting of a sloping section made of railroad rails bolted to solid rock and a vertical section of heavy timber bolted to the vertical face of the rock cliff, was established in 1873 by the United States Army engineers, but since July 1, 1891, it has been in charge of the United States Weather Bureau, by whom gage heights are furnished to the United States Geological Survey.

Discharge measurements were made by the Army engineers in 1891 and 1892 and by the Weather Bureau in 1893, and have been continued by the United States Geological Survey since 1897.

A dam about 20 miles down the river when completed will raise the low-water surface several feet on the Chattanooga gage, thus destroying the usefulness of the gaging station. Comparisons of hydrographs of daily discharge at Knoxville, Chattanooga, and Florence do not show any effect from backwater at Chattanooga during 1910.

Conditions for discharge measurements are good, as is also the station rating curve, which has remained practically constant. The gage datum has not been changed and the original iron sloping gage is the standard gage, although a recording gage is also used.

Discharge measurements of Tennessee River at Chattanooga, Tenn., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 27	M. R. Hall	1,126	16,760	12.42	76,000
Sept. 24	do	1,100	6,150	2.40	13,000

Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.4	5.0	7.8	3.5	6.2	7.5	6.0	7.3	2.9	2.5	1.4	1.7
2	2.3	4.9	10.8	3.4	5.6	6.8	6.3	8.1	3.7	2.6	1.4	1.8
3	2.2	4.7	13.6	3.3	5.2	6.3	6.4	6.8	9.1	2.8	1.4	1.8
4	2.9	4.5	13.2	3.2	4.9	6.2	7.0	5.9	8.7	2.8	1.4	1.8
5	3.0	4.6	11.7	3.2	4.6	5.9	7.0	5.6	7.3	2.6	1.4	2.1
6	3.6	4.8	9.9	3.1	4.4	6.9	6.8	6.2	6.8	2.4	1.4	4.8
7	6.0	5.1	8.6	3.1	4.2	8.5	7.6	6.4	6.2	2.3	1.4	8.4
8	11.6	5.1	7.6	2.9	4.2	9.3	9.3	6.2	6.2	2.3	1.4	10.6
9	11.6	5.0	6.9	2.9	6.9	8.0	11.6	6.5	5.8	2.3	1.4	8.7
10	9.8	4.7	6.5	2.8	8.4	7.4	11.1	5.6	5.3	2.4	1.4	8.0
11	9.0	4.6	6.1	2.8	8.7	7.3	10.6	5.7	5.2	2.9	1.4	6.3
12	7.3	4.5	6.1	2.8	8.7	7.1	10.4	5.4	4.9	3.1	1.3	5.0
13	6.0	4.4	6.1	2.7	8.5	6.9	8.9	4.7	4.9	3.1	1.3	4.2
14	5.3	4.4	5.9	2.7	7.4	7.2	8.1	4.3	4.7	2.9	1.3	3.7
15	4.8	4.4	5.8	2.7	6.7	7.5	8.2	3.9	4.2	2.5	1.3	3.3
16	4.5	4.3	5.7	3.0	6.1	7.4	8.5	3.8	3.8	2.3	1.2	3.0
17	4.4	4.3	5.4	3.8	6.1	7.9	8.9	3.6	3.5	2.1	1.2	2.8
18	4.3	7.3	5.1	6.2	6.2	7.9	8.6	3.5	3.3	2.0	1.2	2.6
19	4.2	12.6	4.9	8.0	7.0	7.8	8.3	3.3	3.0	2.0	1.2	2.5
20	5.1	13.9	4.7	7.5	7.6	7.2	7.5	3.3	2.9	1.9	1.2	2.4
21	6.8	12.9	4.5	6.8	8.3	7.0	6.9	3.2	2.7	1.8	1.2	2.4
22	8.1	11.7	4.4	6.2	9.2	6.7	6.5	3.7	2.6	1.7	1.2	2.4
23	9.6	10.4	4.4	5.7	9.4	6.5	6.1	3.7	2.6	1.7	1.2	2.4
24	9.4	9.9	4.1	5.2	9.1	6.0	5.7	3.4	2.5	1.6	1.2	2.4
25	9.3	9.2	4.1	4.9	11.1	5.9	5.3	3.3	2.4	1.6	1.2	2.4
26	8.2	8.2	4.1	4.9	13.4	5.9	5.2	3.2	2.3	1.6	1.2	2.6
27	7.0	7.2	4.0	4.9	12.7	5.8	5.0	3.1	2.3	1.6	1.2	3.1
28	6.3	6.8	3.8	5.1	11.8	5.6	4.8	3.0	2.4	1.6	1.3	3.3
29	5.8	.....	3.8	6.0	10.7	5.8	4.8	2.9	2.4	1.6	1.5	3.4
30	5.4	.....	3.7	6.5	9.2	5.9	5.2	3.1	2.5	1.6	1.5	3.4
31	5.3	.....	3.6	.....	7.8	.....	5.7	3.1	.....	1.5	.....	3.7

NOTE.—Relation of gage height to discharge probably not affected by ice.

Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	13,100	27,200	45,000	18,600	34,600	43,000	33,300	41,700	15,500	13,600	8,730	9,900
2	12,600	26,600	65,000	18,100	30,800	38,400	35,200	47,000	19,700	14,000	8,730	10,300
3	12,100	25,400	83,900	17,600	28,400	35,200	35,800	38,400	53,600	15,000	8,730	10,300
4	15,500	24,300	81,200	17,000	26,600	34,600	39,700	32,700	50,900	15,000	8,730	10,300
5	16,000	24,800	71,000	17,000	24,800	32,700	39,700	30,800	41,700	14,000	8,730	11,700
6	19,200	26,000	58,900	16,500	23,700	32,700	38,400	34,600	38,400	13,100	8,730	26,000
7	33,300	27,800	50,300	16,500	22,500	49,600	43,700	35,800	34,600	12,600	8,730	48,900
8	70,300	27,800	43,700	15,500	22,500	54,900	54,900	34,600	34,600	12,600	8,730	63,600
9	70,300	27,200	39,000	15,500	39,000	46,300	70,300	36,500	32,100	12,600	8,730	50,900
10	58,300	25,400	36,500	15,000	48,900	42,300	67,000	30,800	29,000	13,100	8,730	46,300
11	52,900	24,800	33,900	15,000	50,900	41,700	63,600	31,400	28,400	15,500	8,730	35,200
12	41,700	24,300	33,900	15,000	50,900	40,400	62,300	29,600	26,600	16,500	8,380	27,200
13	33,300	23,700	33,900	14,500	49,600	39,000	52,200	25,400	26,600	16,500	8,380	22,500
14	29,000	23,700	32,700	14,500	42,300	41,000	47,000	23,100	25,400	15,500	8,380	19,700
15	26,000	23,700	32,100	14,500	37,800	43,000	47,600	20,800	22,500	13,600	8,380	17,600
16	24,300	23,100	31,400	16,000	33,900	42,300	49,600	20,300	20,300	12,600	8,050	16,000
17	23,700	23,100	29,600	20,300	33,900	45,600	52,200	19,200	18,600	11,700	8,050	15,000
18	23,100	41,700	27,800	34,600	34,600	45,600	50,300	18,600	17,600	11,200	8,050	14,000
19	22,500	77,100	26,600	46,300	39,700	45,000	48,300	17,600	16,000	11,200	8,050	13,600
20	27,800	85,900	25,400	43,000	43,700	41,000	43,000	17,600	15,500	10,800	8,050	13,100
21	38,400	79,100	24,300	38,400	48,300	39,700	39,000	17,000	14,500	10,300	8,050	13,100
22	47,000	71,000	23,700	34,600	54,200	37,800	36,500	19,700	14,000	9,900	8,050	13,100
23	56,900	62,300	23,700	31,400	55,600	36,500	33,900	19,700	14,000	9,900	8,050	13,100
24	55,600	58,900	22,000	28,400	53,600	33,300	31,400	18,100	13,600	9,490	8,050	13,100
25	54,900	54,200	22,000	26,600	67,000	32,700	29,000	17,600	13,100	9,490	8,050	13,100
26	47,600	47,600	22,000	26,600	82,500	32,700	28,400	17,000	12,600	9,490	8,050	14,000
27	39,700	41,000	21,400	26,600	77,800	32,100	27,200	16,500	12,600	9,490	8,050	16,500
28	35,200	38,400	20,300	27,800	71,700	30,800	26,000	16,000	13,100	9,490	8,380	17,600
29	32,100	.....	20,300	33,300	64,300	32,100	26,000	15,500	13,100	9,490	9,100	18,100
30	29,600	.....	19,700	36,500	54,200	32,700	28,400	16,500	13,600	9,490	9,100	18,100
31	29,000	.....	19,200	.....	45,000	.....	31,400	16,500	.....	9,100	.....	19,700

NOTE.—Daily discharge determined from a rating curve well defined between 8,050 and 37,100 second-feet (gage heights 1.2 and 6.6 feet), fairly well defined between 37,800 and 86,600 second-feet (gage heights 6.7 and 14.0 feet), and poorly defined above 86,600 second-feet (gage height 14.0 feet). The discharge rating curve is based on 3 measurements made during 1910 and the form of the 1909 rating curve.

Monthly discharge of Tennessee River at Chattanooga, Tenn., for 1910.

[Drainage area, 21,400 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	70,300	12,100	35,200	1.64	1.89	A.
February	85,900	23,100	38,800	1.81	1.88	A.
March	83,900	19,200	36,100	1.69	1.95	A.
April	46,300	14,500	23,700	1.11	1.24	A.
May	82,500	22,500	44,900	2.10	2.42	A.
June	54,900	30,800	39,200	1.83	2.04	A.
July	70,300	26,000	42,300	1.98	2.28	A.
August	47,000	15,500	25,100	1.17	1.35	A.
September	53,600	12,600	23,400	1.09	1.22	A.
October	16,500	9,100	12,100	.565	.65	A.
November	9,100	8,050	8,420	.393	.44	A.
December	63,600	9,900	21,000	.981	1.13	A.
The year	85,900	8,050	29,200	1.36	18.49	

HOLSTON RIVER BASIN.

GENERAL FEATURES.

Holston River rises in Wythe and Bland counties, Va., partly in the western border of the Appalachian Mountains and partly in the plateau region of the Appalachian Valley, in three forks known as the North, Middle, and South forks. These forks flow almost parallel and rather close together in a southwesterly direction conforming with the long ridges and valleys characteristic of the drainage basin, and continue in the same general direction and entirely in the Appalachian Valley until they have united and the main stream has joined the French Broad to form the Tennessee.

Although it contains many steep and rocky mountainous ridges, the valley portion of the Holston basin is mainly an agricultural region a large part of its area being cleared and under cultivation. The valley parallels the western mountain border and the tributaries from that side are mountain streams, some of them descending from great heights.

Watauga River, a large and important tributary, heads with the Catawba on Grandfather Mountain in the Blue Ridge and, like French Broad and Little Tennessee rivers, cuts entirely across the Appalachian Mountains. It is the uppermost of the Tennessee River tributaries to occupy the entire width of the Appalachian summit. The mountains in its basin are high and rugged and are mostly forest covered.

The average annual rainfall in the Holston River basin is about 45 inches.

SOUTH FORK OF HOLSTON RIVER AT BLUFF CITY, TENN.

This station, which is located at the highway bridge at Bluff City, Tenn., about 300 feet below the bridge of the Virginia & Southwestern Railroad, about 10 miles above the mouth of Watauga River and 1 mile below Indian Creek, was originally established by the United States Weather Bureau. The United States Geological Survey maintained gage heights from July 17, 1900, to December 31, 1904, but since that time the records have been furnished by the United States Weather Bureau.

The total drainage area above the station is 828 square miles.

The flow is not affected by artificial control nor, unless for a few days during exceptional years, by ice.

The staff gage, which is attached to the downstream side of a bridge pier, has not been changed.

The bed is rocky and very rough, and ledges above and below the bridge cause eddies and sudden variations in the velocity, making discharge measurements difficult. The rating curve, however, is fairly good and constant.

No discharge measurements were made during 1910. The station was last inspected September 18, 1909. The accuracy of the recorded daily gage heights and determination of daily and monthly discharge given in the following tables depends on the permanency of the elevation of the gage and of conditions of flow since that date.

Daily gage height, in feet, of South Fork of Holston River at Bluff City, Tenn., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.4	2.3	0.8	1.5	0.9	0.8	1.3	0.9	0.4	0.4	1.3
2	0.5	1.3	2.7	.7	1.3	.8	.7	1.1	.8	.4	.4	1.2
3	.7	1.3	2.5	.6	1.2	.7	.7	1.0	1.0	.3	.4	.7
4	.4	1.5	2.2	.6	1.1	.7	.7	1.0	2.0	.3	.3	.6
5	1.3	1.9	2.0	.6	1.1	1.3	.7	1.8	2.2	.3	.3	.9
6	1.3	1.7	1.8	.6	1.0	1.8	2.0	1.4	1.7	.3	.3	4.0
7	2.8	1.5	1.8	.7	.9	1.8	3.6	1.2	1.3	.3	.3	4.0
8	3.3	1.3	1.7	.6	1.1	1.5	5.6	1.1	1.1	.3	.2	2.7
9	2.3	1.3	1.6	.5	1.6	1.3	3.7	1.0	1.2	.5	.2	2.0
10	1.5	1.3	1.5	.5	1.6	1.3	2.6	1.0	1.2	.4	.2	1.5
11	1.4	1.3	1.5	.5	1.5	1.2	2.1	1.0	1.2	.3	.2	1.3
12	1.2	1.1	1.5	.6	1.5	1.3	1.8	.8	.9	.3	.2	1.2
13	1.2	1.0	1.4	.9	2.3	1.5	2.1	.8	.8	.3	.1	1.2
14	1.0	.8	1.3	1.5	2.0	2.7	2.0	.8	.8	.3	.1	1.2
15	1.1	1.3	1.2	1.3	1.7	3.1	2.0	.8	.8	.2	.3	1.2
16	.9	1.1	1.1	1.1	1.5	2.7	1.7	.7	.6	.2	.5	1.2
17	.8	1.1	1.0	1.5	1.4	3.4	1.6	.6	.5	.2	.4	1.1
18	.8	3.2	1.0	1.4	1.4	2.4	2.1	.6	.5	.2	.3	1.1
19	2.1	3.3	1.0	1.6	1.4	2.2	2.3	.5	.4	.2	.3	.9
20	2.3	2.5	1.0	1.6	1.3	1.8	1.7	.7	.4	.2	.3	.9
21	2.3	2.0	.9	1.6	1.2	2.1	1.6	.6	.5	.2	.3	.8
22	3.6	2.0	.9	1.6	1.4	1.7	1.5	.6	.4	.4	.3	.....
23	2.6	2.0	.9	1.5	1.3	1.5	1.3	.7	.4	.4	.3	.....
24	2.3	1.8	.8	1.5	1.3	1.5	1.2	.5	.4	.4	.3	1.0
25	2.0	1.7	.8	1.7	1.3	2.0	1.1	.5	.4	.3	.2	1.3
26	1.7	1.5	.8	1.7	1.3	1.5	1.0	.5	.4	.3	1.3	1.2
27	1.6	1.5	.8	1.7	1.7	1.1	1.0	.5	.4	.3	.8	1.2
28	1.6	1.3	.8	1.7	1.4	1.0	1.3	.5	.5	.8	.9	1.1
29	1.6	.....	.8	1.6	1.3	.9	2.4	.5	.5	.8	2.2	1.0
30	1.5	.....	.7	1.5	1.1	.8	1.7	.5	.4	.6	2.0	1.5
31	1.4	.....	.8	.....	1.0	.....	1.5	.4	.....	.5	.....	2.7

NOTE.—River reported "frozen" Jan. 1, Dec. 22 and 23.

Daily discharge, in second-feet, of South Fork of Holston River at Bluff City, Tenn., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	300	940	1,790	530	1,020	590	530	860	590	325	325	860
2	370	860	2,250	475	860	530	425	715	530	325	325	785
3	475	860	2,010	420	785	425	425	650	650	285	325	475
4	325	1,020	1,680	420	715	425	425	650	1,480	285	285	420
5	860	1,380	1,480	420	715	860	425	1,280	1,680	285	285	590
6	860	1,190	1,280	420	650	1,280	1,480	940	1,190	285	285	4,060
7	2,370	1,020	1,280	475	590	1,280	3,460	785	860	285	285	4,060
8	3,040	860	1,190	420	715	1,020	6,990	715	715	285	245	2,250
9	1,790	860	1,100	370	1,100	860	3,610	650	785	370	245	1,480
10	1,020	860	1,020	370	1,100	860	2,130	650	785	325	245	1,020
11	940	860	1,020	370	1,020	785	1,580	650	785	285	245	860
12	785	715	1,020	420	1,020	860	1,280	530	590	285	245	785
13	785	650	940	590	1,790	1,020	1,580	530	530	285	212	785
14	650	530	860	1,020	1,480	2,250	1,480	530	530	285	212	785
15	715	860	785	860	1,190	2,760	1,480	530	530	245	285	785
16	590	715	715	715	1,020	2,250	1,190	475	420	245	370	785
17	530	715	650	1,020	940	3,180	1,100	420	370	245	325	715
18	530	2,900	650	940	940	1,900	1,580	420	370	245	285	715
19	1,580	3,040	650	1,100	940	1,680	1,790	370	325	245	285	590
20	1,790	2,010	650	1,100	860	1,280	1,190	475	325	245	285	590
21	1,790	1,480	590	1,100	785	1,580	1,100	420	370	245	285	530
22	3,460	1,480	596	1,100	940	1,190	1,020	420	325	325	285	500
23	2,130	1,480	590	1,020	860	1,020	860	475	325	325	285	500
24	1,790	1,280	530	1,020	860	1,020	785	370	325	325	285	650
25	1,480	1,190	530	1,190	860	1,480	715	370	325	285	245	860
26	1,190	1,020	530	1,190	860	1,020	650	370	325	285	860	785
27	1,100	1,020	530	1,190	1,190	715	650	370	325	285	530	785
28	1,100	860	530	1,190	940	650	860	370	370	530	590	715
29	1,100	.....	530	1,100	860	590	1,900	370	370	530	1,680	650
30	1,020	.....	475	1,020	715	530	1,190	370	325	420	1,480	1,020
31	940	.....	530	.....	650	.....	1,020	325	.....	370	.....	2,250

NOTE.—Daily discharge determined from a rating curve fairly well defined between 185 and 3,320 second-feet (gage heights 0 and 3.5 feet), and poorly defined between 3,460 and 6,990 second-feet (gage heights 3.6 and 5.6 feet). Daily discharge Jan. 1, Dec. 22 and 23, estimated, because of ice.

Monthly discharge of South Fork of Holston River at Bluff City, Tenn., for 1910.

[Drainage area, 828 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	3,460	300	1,210	1.46	1.68	B.
February	3,040	530	1,170	1.41	1.47	B.
March	2,250	475	935	1.13	1.30	B.
April	1,190	370	789	.953	1.06	B.
May	1,790	590	935	1.13	1.30	B.
June	3,180	425	1,200	1.45	1.62	B.
July	6,990	425	1,450	1.75	2.02	B.
August	1,280	325	550	.664	.77	B.
September	1,680	325	581	.702	.78	B.
October	530	245	309	.373	.43	B.
November	1,680	212	404	.488	.54	B.
December	4,060	420	1,050	1.27	1.46	B.
The year	6,990	212	880	1.06	14.43	

HOLSTON RIVER NEAR ROGERSVILLE, TENN.

This station, which is located at the Virginia & Southwestern Railway bridge, 1 mile north of Austins Mills and 3 miles south of Rogersville, Tenn., was established by the United States Weather Bureau March 10, 1902, and all gage heights have been furnished by the Weather Bureau.

The station is just below the mouth of Honeycut Creek and about 2 miles below Dodson Creek, both of which are small tributaries entering from the south.

The vertical staff gage is attached to the downstream end of the bridge pier nearest the right bank.

The section of river is good for measurements, but the high-decked railroad bridge is difficult and somewhat dangerous to work from. The conditions of flow are practically constant, and a good rating curve has been developed for the low and ordinary stages.

No discharge measurements were made during 1910. The station was last inspected March 16, 1909. The accuracy of the recorded daily gage heights and the determination of daily and monthly discharge given in the following tables depends on the permanency of the elevation of the gage and of conditions of flow since that date.

Daily gage height, in feet, of Holston River near Rogersville, Tenn., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.4	2.5	3.7	1.8	2.4	2.3	2.0	2.7	1.8	1.7	1.6	2.4
2	1.4	2.5	4.2	1.7	2.2	2.1	2.0	2.4	3.2	1.7	1.5	2.1
3	1.4	2.4	4.0	1.7	2.0	2.0	1.9	2.3	2.6	1.7	1.5	1.8
4	1.4	2.5	3.6	1.6	2.0	2.0	1.9	2.6	3.3	1.6	1.5	1.7
5	2.4	2.8	3.3	1.6	1.9	2.0	1.9	2.8	3.8	1.6	1.5	1.7
6	2.4	3.0	3.1	1.6	1.9	2.6	2.0	2.6	3.5	1.6	1.5	3.2
7	3.0	2.8	2.9	1.6	1.9	2.9	3.4	2.3	2.9	1.6	1.5	6.0
8	4.6	2.6	2.9	1.6	2.1	3.0	4.4	2.8	2.6	1.6	1.5	4.3
9	3.8	2.5	2.9	1.6	2.6	2.6	5.5	2.8	2.5	1.8	1.5	3.3
10	3.1	2.4	2.7	1.5	3.0	2.4	4.0	2.6	3.2	1.8	1.5	2.8
11	2.6	2.4	2.7	1.5	2.8	2.3	3.4	2.4	2.7	1.8	1.5	2.6
12	2.3	2.4	2.7	1.5	2.6	2.5	3.0	2.2	2.5	1.7	1.5	2.4
13	2.2	2.3	2.6	1.5	2.8	2.5	2.6	2.1	2.4	1.7	1.5	2.4
14	2.4	2.1	2.5	1.6	3.1	2.9	3.2	2.0	2.3	1.6	1.5	2.2
15	2.2	2.0	2.4	2.0	2.9	3.8	3.0	2.0	2.1	1.6	1.5	2.0
16	2.2	2.6	2.4	2.1	2.7	4.0	3.5	2.0	1.9	1.6	1.5	1.9
17	2.0	2.8	2.3	2.0	2.5	3.8	2.7	1.9	1.9	1.6	1.5	1.9
18	1.8	3.5	2.3	2.4	2.5	4.3	3.0	1.9	1.9	1.6	1.5	1.9
19	2.8	5.2	2.2	2.5	2.5	3.5	3.2	1.9	1.8	1.5	1.5	1.8
20	3.7	4.3	2.2	2.5	2.5	3.0	3.1	2.3	1.8	1.5	1.5	2.0
21	4.0	3.6	2.2	2.4	2.4	2.7	2.8	2.0	1.8	1.5	1.5	1.9
22	5.0	3.8	2.1	2.4	2.3	2.8	2.4	2.0	1.8	1.5	1.5	1.8
23	4.5	3.6	2.1	2.4	2.3	2.8	2.4	1.9	1.8	1.6	1.5	1.5
24	3.6	3.3	2.0	2.6	2.3	2.7	2.4	1.8	1.8	1.6	1.5	1.5
25	3.3	3.0	1.9	2.5	4.1	2.7	2.3	1.8	1.8	1.6	1.5	2.1
26	2.9	2.8	1.9	2.6	4.4	3.0	2.2	1.7	1.7	1.5	1.6	2.4
27	2.7	2.7	1.9	2.7	3.6	2.5	2.1	1.7	1.7	1.5	1.6	2.4
28	2.7	2.6	1.8	2.7	3.1	2.2	2.7	1.7	1.7	1.5	1.7	2.3
29	2.6	.....	1.8	2.6	2.7	2.1	4.4	1.7	1.9	1.6	1.9	2.1
30	2.6	.....	1.8	2.5	2.5	2.0	3.8	1.6	1.8	1.7	2.8	2.5
31	2.6	.....	1.8	.....	2.4	.....	3.1	1.7	.....	1.6	.....	2.8

NOTE.—Gage heights probably not affected by ice.

Daily discharge, in second-feet, of Holston River near Rogersville, Tenn., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,140	3,420	6,720	1,900	3,190	2,960	2,310	3,900	1,900	1,700	1,510	3,190
2	1,140	3,420	8,400	1,700	2,740	2,520	2,310	3,190	5,220	1,700	1,320	2,520
3	1,140	3,190	7,710	1,700	2,310	2,310	2,100	2,960	3,660	1,700	1,320	1,900
4	1,140	3,420	6,410	1,510	2,310	2,310	2,100	3,660	5,510	1,510	1,320	1,700
5	3,190	4,150	5,510	1,510	2,100	2,310	2,100	4,150	7,040	1,510	1,320	1,700
6	3,190	4,670	4,940	1,510	2,100	3,660	2,310	3,660	6,100	1,510	1,320	5,220
7	4,670	4,150	4,410	1,510	2,100	4,410	5,800	2,960	4,410	1,510	1,320	15,400
8	9,860	3,660	4,410	1,510	2,520	4,670	9,120	4,150	3,660	1,510	1,320	8,760
9	7,040	3,420	4,410	1,510	3,660	3,660	13,400	4,150	3,420	1,900	1,320	5,510
10	4,940	3,190	3,900	1,320	4,670	3,190	7,710	3,660	5,220	1,900	1,320	4,150
11	3,660	3,190	3,900	1,320	4,150	2,960	5,800	3,190	3,900	1,900	1,320	3,660
12	2,960	3,190	3,900	1,320	3,660	3,420	4,670	2,740	3,420	1,700	1,320	3,190
13	2,740	2,960	3,660	1,320	4,150	3,420	3,660	2,520	3,190	1,700	1,320	3,190
14	3,190	2,520	3,420	1,510	4,940	4,410	5,220	2,310	2,960	1,510	1,320	2,740
15	2,740	2,310	3,190	2,310	4,410	7,040	4,670	2,310	2,520	1,510	1,320	2,310
16	2,740	3,660	3,190	2,520	3,900	7,710	6,100	2,310	2,100	1,510	1,320	2,100
17	2,310	4,150	2,960	2,310	3,420	7,040	3,900	2,100	2,100	1,510	1,320	2,100
18	1,900	6,100	2,960	3,190	3,420	8,760	4,670	2,100	2,100	1,510	1,320	2,100
19	4,150	12,200	2,740	3,420	3,420	6,100	5,220	2,100	1,900	1,320	1,320	1,900
20	6,720	8,760	2,740	3,420	3,420	4,670	4,940	2,960	1,900	1,320	1,320	2,310
21	7,710	6,410	2,740	3,190	3,190	3,900	4,150	2,310	1,900	1,320	1,320	2,100
22	11,400	7,040	2,520	3,190	2,960	4,150	3,190	2,310	1,900	1,320	1,320	1,900
23	9,490	6,410	2,520	3,190	2,960	4,150	3,190	2,100	1,900	1,510	1,320	1,320
24	6,410	5,510	2,310	3,660	2,960	3,900	3,190	1,900	1,900	1,510	1,320	1,320
25	5,510	4,670	2,100	3,420	8,050	3,900	2,960	1,900	1,900	1,510	1,320	2,520
26	4,410	4,150	2,100	3,660	9,120	4,670	2,740	1,700	1,700	1,320	1,510	3,190
27	3,900	3,900	2,100	3,900	6,410	3,420	2,520	1,700	1,700	1,320	1,510	3,190
28	3,900	3,660	1,900	3,900	4,940	2,740	3,900	1,700	1,700	1,320	1,700	2,960
29	3,660	.....	1,900	3,660	3,900	2,520	9,120	1,700	2,100	1,510	2,100	2,520
30	3,660	.....	1,900	3,420	3,420	2,310	7,040	1,510	1,900	1,700	4,150	3,420
31	3,660	.....	1,900	.....	3,190	.....	4,940	1,700	.....	1,510	.....	4,150

NOTE.—Daily discharge determined from a rating curve well defined between 490 and 15,400 second-feet (gage heights 1.0 and 6.0 feet).

Monthly discharge of Holston River near Rogersville, Tenn., for 1910.

[Drainage area, 3,060 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	11,400	1,140	4,330	1.42	1.63	A.
February	12,200	2,310	4,550	1.49	1.55	A.
March	8,400	1,900	3,660	1.20	1.38	A.
April	3,900	1,320	2,450	.801	.89	A.
May	9,120	2,100	3,800	1.24	1.43	A.
June	8,760	2,310	4,110	1.34	1.50	A.
July	13,400	2,100	4,680	1.53	1.76	A.
August	4,150	1,510	2,630	.859	.99	A.
September	7,040	1,700	3,030	.990	1.10	A.
October	1,900	1,320	1,540	.503	.58	A.
November	4,150	1,320	1,470	.481	.54	A.
December	15,400	1,320	3,360	1.10	1.27	A.
The year	15,400	1,140	3,300	1.08	14.62	

LITTLE TENNESSEE RIVER BASIN.

GENERAL FEATURES.

Little Tennessee River with its tributaries drains a large area extending from the Blue Ridge on the south to the Great Smoky Mountains on the north, including the territory between the basins of Pigeon and Hiwassee rivers. Its larger tributaries are the Tuckasegee from the east and the Nantahala from the south, and these streams, with the upper portion of the Little Tennessee as a middle fork, all head on top of the Blue Ridge. After cutting through the northwestern mountain rim with a great amount of fall the river enters a broad and almost level plain extending to Tennessee River.

The upper or southern part of the basin, lying on the northwest slope of the Blue Ridge, is an elevated plateau with low, rounded granite knobs and few high summits and having a general altitude of more than 3,000 feet above sea level.

Farther downstream, in the interior and toward the northwestern border of the mountain section, the Balsam, Cowee, Nantahala, Cheoah, Unaka, and Great Smoky mountains, with many crests over 6,000 feet high, form the watershed, and from these descend many swift streams which have carved deep, narrow valleys, leaving high and irregular intervening ridges. The lower part of the basin includes some of the most rugged land in the southern Appalachians and contains only a very small part suited for tillage, but in the upper part much of the mountain land is not steep and there are several large and fertile valleys. As a whole, this basin probably contains a larger proportion of original forests and better timber than any basin in the southern Appalachian region. The great mountains on the northwestern border especially are almost entirely in forests.

The soils in the upper part of the basin are derived from granite and are sandy. On Little Tennessee River around and above Franklin, where most of the good farms are located, they comprise deep and fertile red loams, derived from schists. In the narrow valleys around the high mountains, where sandstones, quartzite, and conglomorates prevail, the soils are generally thin, sandy, and agriculturally poor, but on north slopes and in hollows they are well suited to forests.

The mean annual rainfall for the Little Tennessee River basin is about 52 inches.

LITTLE TENNESSEE RIVER NEAR FRANKLIN, N. C.

This station, which is located at the iron wagon bridge, about 1 mile northeast of Franklin, N. C., was established June 12, 1907, in cooperation with the Forest Service, to supply data regarding the water resources and power sites in the southern Appalachian Mountains.

The station is 1 mile below the mouth of Cullasagee River, which is an important tributary, and about 1 mile above the mouth of Cat Creek. The total drainage area above the station is 297 square miles. The few mills above the station probably cause a small amount of variation in the flow.

Discharge measurements are made from the bridge, where the river has high banks, permanent, rocky bottom, and swift current, and is about 125 feet wide.

The vertical staff gage is attached to a tree on the left bank about 700 feet above the bridge. Its datum has not been changed.

Backwater from a fish-trap dam about 2,000 feet below the gage affected the relation of gage height to discharge during 1910 and part of 1909. This station was abandoned July 12, 1910, on account of the effect of the fish-trap dam.

Discharge measurements of Little Tennessee River near Franklin, N. C., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 25	M. R. Hall	128	288	2.49	827
25	do	128	288	2.49	833

Daily gage height, in feet, of Little Tennessee River near Franklin, N. C., for 1910.

[Lewis Angel, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	1.9	1.9	4.5	1.95	1.85	2.65	1.9	16	2.0	1.85	2.2	1.9	2.5	3.0	.....
2	1.95	1.85	4.4	1.9	1.85	2.55	1.8	17	2.0	2.0	2.2	4.0	2.55	2.8	.....
3	2.0	2.0	3.6	1.9	1.8	2.9	1.9	18	2.0	4.4	2.15	2.65	2.95	2.55	.....
4	2.0	2.0	3.1	1.9	1.9	2.5	1.95	19	2.0	3.1	2.1	2.4	2.55	2.5	.....
5	1.95	1.9	2.95	1.9	1.75	3.3	1.9	20	1.95	2.7	2.3	2.3	2.9	2.4	.....
6	1.9	1.85	2.75	2.0	1.75	3.9	3.1	21	2.95	2.5	2.2	2.1	3.6	2.5	.....
7	4.6	1.85	2.65	1.8	1.8	3.1	3.6	22	2.4	2.5	2.15	2.05	4.0	2.5	.....
8	3.1	1.85	2.5	1.8	5.5	2.9	3.0	23	2.25	2.45	2.1	2.0	3.4	2.5	.....
9	2.6	1.9	2.4	1.8	5.1	2.8	2.9	24	2.1	2.4	2.05	2.1	4.9	2.5	.....
10	2.4	1.9	2.45	1.75	4.5	2.6	2.7	25	2.05	2.4	2.05	2.05	3.2	2.5	.....
11	2.3	2.05	2.7	1.75	3.1	2.5	2.65	26	2.1	2.35	2.0	2.0	3.8	2.35	.....
12	2.2	2.0	2.5	2.0	3.0	2.8	2.75	27	2.1	2.55	2.0	2.1	3.3	2.25	.....
13	2.15	1.95	2.4	1.9	2.7	2.9	.....	28	2.05	2.9	2.0	2.0	3.0	2.2	.....
14	2.3	1.9	2.3	1.8	2.5	3.0	.....	29	2.0	.....	1.95	1.95	2.9	2.2	.....
15	2.2	1.85	2.25	1.75	2.45	2.9	.....	30	2.0	.....	1.95	1.9	3.1	2.3	.....
								31	1.95	.....	1.95	.....	2.7	.....	.....

NOTE.—Daily gage height affected by backwater from fish-trap dam about 2,000 feet below the gage.

Daily discharge, in second-feet, of Little Tennessee River near Franklin, N. C., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	555	555	2,480	575	535	930	555
2	575	535	2,380	555	535	870	515
3	595	595	1,640	555	515	1,090	555
4	595	595	1,240	555	555	840	575
5	575	555	1,120	555	498	1,390	555
6	555	535	992	595	498	1,910	1,240
7	2,580	535	930	515	515	1,240	1,640
8	1,240	535	840	515	3,500	1,090	1,160
9	900	555	785	515	3,080	1,020	1,090
10	785	555	812	498	2,480	900	960
11	735	618	960	498	1,240	840	930
12	685	595	840	595	1,160	1,020	992
13	662	575	785	555	960	1,090	.....
14	735	555	735	515	840	1,160	.....
15	685	535	710	498	812	1,090	.....
16	595	535	685	555	840	1,160	.....
17	595	595	685	2,000	870	1,020	.....
18	595	2,380	662	930	1,120	870	.....
19	595	1,240	640	785	870	840	.....
20	575	960	735	735	1,090	785	.....
21	1,120	840	685	640	1,640	840	.....
22	785	840	662	618	2,000	840	.....
23	710	812	640	595	1,470	840	.....
24	640	785	618	640	2,880	840	.....
25	618	785	618	618	1,310	840	.....
26	640	760	595	595	1,820	760	.....
27	640	870	595	640	1,390	710	.....
28	618	1,090	595	595	1,160	685	.....
29	595	.....	575	575	1,090	685	.....
30	595	.....	575	555	1,240	735	.....
31	575	.....	575	.....	960	.....	.....

NOTE.—Daily discharge determined by means of a discharge rating curve that is poorly defined.

Monthly discharge of Little Tennessee River near Franklin, N. C., for 1910.

[Drainage area, 297 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,580	555	740	2.49	2.87	C.
February	2,380	535	747	2.52	2.62	C.
March	2,480	575	884	2.98	3.44	C.
April	2,000	498	646	2.18	2.43	C.
May	3,500	498	1,270	4.28	4.93	C.
June	1,910	685	964	3.25	3.63	B.
July 1–12	1,640	515	897	3.02	1.35	B.

LITTLE TENNESSEE RIVER AT JUDSON, N. C.

This station, which is located at the Southern Railway bridge about a quarter of a mile from Judson, N. C., and a short distance below the mouth of Sawyer Branch, was established in June, 1896. The station is 1 mile below the mouth of Alarka Creek, 2½ miles below the mouth of Nantahala River, and about 4 miles above the mouth of Tuckasegee River. The total drainage area above the station is 675 square miles.

During 1903 the original wire gage was replaced by a standard chain gage having the same location and datum, which was used until June 30, 1905. Since July 1, 1905, a vertical gage bolted to a solid rock on the right bank, about 100 feet above the bridge, has been used. This gage was set to read with the chain gage at a gage height of 3 feet, but owing to the large amount of slope in the river the actual elevation of its zero is 0.50 foot above the datum of the chain gage.

The river bed is rocky and uneven and the current is swift and rough, making measurements difficult at any but low stages. The flow is little affected by artificial control, and conditions are probably constant, although many of the measurements plot wide, owing, it is thought, to the rough bottom and broken current.

Discharge measurements of Little Tennessee River at Judson, N. C., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Nov. 16	M. R. Hall	127	234	2.50	563
16	do	127	223	2.49	596
17	do	175	[a] 555	2.47	589

[a] Measurement made from footway of flume bridge about 2,000 feet above the railroad bridge.

Daily gage height, in feet, of Little Tennessee River at Judson, N. C., for 1910.

[Miss E. G. Enloe, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.3	3.5	6.7	3.3	3.3	4.5	3.7	3.4	3.3	3.0	2.6	2.5
2	3.5	3.5	6.0	3.2	3.2	4.1	3.7	3.4	4.0	3.0	2.6	2.4
3	3.5	3.4	5.2	3.2	3.2	4.1	4.1	4.2	3.3	2.8	2.6	2.4
4	3.5	3.4	5.0	3.2	3.1	4.0	4.7	4.2	3.25	2.7	2.6	2.5
5	3.5	3.4	4.4	3.2	3.1	4.0	4.7	4.2	3.2	2.7	2.6	6.5
6	3.4	3.4	4.3	3.2	3.1	5.2	4.6	4.5	3.15	2.7	2.6	4.5
7	6.7	3.4	4.2	3.2	3.1	5.0	4.7	4.5	3.1	3.0	2.5	3.6
8	4.9	3.5	4.2	3.2	6.5	4.9	4.9	4.5	3.0	3.8	2.5	3.05
9	4.8	3.5	4.2	3.1	5.0	4.5	4.7	4.4	3.0	3.5	2.5	2.8
10	4.8	3.5	4.0	3.1	4.9	4.2	4.7	4.4	3.0	3.3	2.5	2.6
11	4.8	3.4	4.5	3.1	4.9	4.2	4.7	4.3	3.0	3.2	2.5	2.8
12	4.3	3.3	4.2	3.1	4.8	4.2	4.7	4.3	2.9	3.0	2.5	2.8
13	4.0	3.2	4.0	3.1	4.8	4.2	4.5	4.2	2.9	3.05	2.5	2.75
14	4.0	3.3	3.9	3.3	4.5	4.5	4.5	3.0	2.9	3.0	2.5	2.7
15	4.9	3.4	3.9	3.3	4.5	4.7	4.1	3.0	2.9	2.9	2.5	2.7
16	3.3	3.4	3.8	3.3	4.0	4.2	4.1	3.0	2.9	2.95	2.5	2.6
17	3.5	3.4	3.8	6.0	3.8	4.1	4.1	4.2	2.9	2.8	2.5	2.6
18	3.3	5.9	3.7	4.8	3.7	4.1	4.1	4.3	2.85	2.85	2.5	2.6
19	4.0	5.0	3.6	4.5	4.5	4.0	3.8	4.3	2.85	2.8	2.5	2.55
20	3.5	4.5	3.6	3.7	4.4	3.9	3.8	3.0	2.8	2.75	2.5	2.55
21	3.3	4.3	3.5	3.6	4.5	3.9	3.6	3.0	2.8	2.7	2.5	2.5
22	3.3	4.3	3.5	3.5	5.0	4.3	3.5	3.0	2.8	2.65	2.5	2.4
23	3.3	4.3	3.4	3.5	4.9	3.8	3.5	3.2	2.8	2.6	2.45	2.4
24	3.3	4.0	3.4	3.4	4.7	4.0	3.5	3.2	2.7	2.6	2.45	2.3
25	3.3	3.8	3.4	3.3	6.2	4.0	3.4	3.1	2.9	2.6	2.45	2.3
26	3.5	3.8	3.4	3.3	5.5	3.8	3.4	3.0	3.0	2.6	2.45	2.25
27	3.5	3.8	3.4	3.3	5.5	3.6	3.4	3.0	3.0	2.6	2.5	2.25
28	3.5	4.4	3.4	3.3	5.5	3.5	3.8	3.0	2.95	2.6	3.8	2.2
29	3.4	.....	3.3	3.5	5.4	3.7	3.8	3.5	2.9	2.8	2.8	4.0
30	3.4	.....	3.3	3.3	4.6	3.7	3.5	3.5	3.1	2.7	2.5	3.6
31	3.5	.....	3.3	.....	4.5	.....	3.5	3.3	.....	2.6	.....	3.6

Daily discharge, in second-feet, of Little Tennessee River at Judson, N. C., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,200	1,390	8,000	1,200	1,200	2,640	1,600	1,300	1,200	950	660	595
2	1,390	1,390	5,900	1,120	1,120	2,050	1,600	1,300	1,930	950	660	530
3	1,390	1,300	3,950	1,120	1,120	2,050	2,050	2,180	1,200	800	660	530
4	1,390	1,300	3,550	1,120	1,030	1,930	2,990	2,180	1,160	730	660	595
5	1,390	1,300	2,480	1,120	1,030	1,930	2,990	2,180	1,120	730	660	7,380
6	1,300	1,300	2,320	1,120	1,030	3,950	2.810	2,640	1,070	730	660	2,640
7	8,000	1,300	2,180	1,120	1,030	3,550	2,990	2,640	1,030	950	595	1,490
8	3,360	1,390	2,180	1,120	7,380	3,360	3,360	2,640	950	1,700	595	990
9	3,170	1,390	2,180	1,030	3,550	2,640	2,990	2,480	950	1,390	595	800
10	3,170	1,390	1,930	1,030	3,360	2,180	2,990	2,480	950	1,200	595	660
11	3,170	1,300	2,640	1,030	3,360	2,180	2,990	2,320	950	1,120	595	800
12	2,320	1,200	2,180	1,030	3,170	2,180	2,990	2,320	875	950	595	800
13	1,930	1,120	1,930	1,030	3,170	2,180	2,640	2,180	875	990	595	765
14	1,930	1,200	1,820	1,200	2,640	2,640	2,640	950	875	950	595	730
15	3,360	1,300	1,820	1,200	2,640	2,990	2,050	950	875	875	595	730
16	1,200	1,300	1,700	1,200	1,930	2,180	2,050	950	875	912	595	660
17	1,390	1,300	1,700	5,900	1,700	2,050	2,050	2,180	875	800	595	660
18	1,200	5,630	1,600	3,170	1,600	2,050	2,050	2,320	838	838	595	660
19	1,930	3,550	1,490	2,640	2,640	1,930	1,700	2,320	838	800	595	628
20	1,390	2,640	1,490	1,600	2,480	1,820	1,700	950	800	765	595	628
21	1,200	2,320	1,390	1,490	2,640	1,820	1,490	950	800	730	595	595
22	1,200	2,320	1,390	1,390	3,550	2,320	1,390	950	800	695	595	530
23	1,200	2,320	1,300	1,390	3,360	1,700	1,390	1,120	800	660	562	530
24	1,200	1,930	1,300	1,300	2,990	1,930	1,390	1,120	730	660	562	470
25	1,200	1,700	1,300	1,200	6,470	1,930	1,300	1,030	875	660	562	470
26	1,390	1,700	1,300	1,200	4,610	1,700	1,300	950	950	660	562	440
27	1,390	1,700	1,300	1,200	4,610	1,490	1,300	950	950	660	595	440
28	1,390	2,480	1,300	1,200	4,610	1,390	1,700	950	912	660	1,700	410
29	1,300	.....	1,200	1,390	4,380	1,600	1,700	1,390	875	800	800	1,930
30	1,300	.....	1,200	1,200	2,810	1,600	1,390	1,390	1,030	730	595	1,490
31	1,390	.....	1,200	.....	2,640	.....	1,390	1,200	.....	660	.....	1,490

NOTE.—Daily discharge determined from discharge rating curve well defined between 530 and 2,990 second-feet (gage heights 2.4 and 4.7 feet, fairly well defined between 3,170 and 10,200 second-feet (gage heights 4.8 and 7.4 feet, and poorly defined above discharge 10,200 second-feet (gage height 7.4 feet).

Monthly discharge of Little Tennessee River at Judson, N. C., for 1910.

[Drainage area, 675 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	8,000	1,200	1,930	2.86	3.30	B.
February	5,630	1,120	1,800	2.67	2.78	B.
March	8,000	1,200	2,170	3.22	3.71	B.
April	5,900	1,030	1,470	2.08	2.32	B.
May	7,380	1,030	2,900	4.30	4.96	B.
June	3,950	1,390	2,200	3.26	3.64	B.
July	3,360	1,300	2,100	3.11	3.58	B.
August	2,640	950	1,660	2.46	2.84	B.
September	1,930	730	965	1.43	1.60	A.
October	1,700	660	861	1.28	1.48	A.
November	1,700	562	647	.954	1.06	A.
December	7,380	410	1,030	1.53	1.76	B.
The year	8,000	410	1,650	2.44	33.03	

LITTLE TENNESSEE RIVER AT M'GHEE, TENN.

This station, which is located at the Louisville & Nashville Railroad bridge about one-third mile south of McGhee, Tenn., and one-half mile below the mouth of Tellico River, was established by the United States Weather Bureau late in 1904, the gage readings begin-

ning November 29 of that year. Since that time discharge measurements have been made by the United States Geological Survey and the daily gage readings have been furnished by the Weather Bureau.

The boxed chain gage is located on the railroad bridge. Owing to a new location of the railroad a new crossing of the river was made 1,000 feet above the old one. The gage was moved to the new bridge December 1, 1905, and was set to read the same as before by raising its datum the exact amount of the slope of river between the points (0.30 foot at gage height 4 feet).

Although the river is navigable up to the station, very valuable water-power sites exist a short distance above. There are no dams of sufficient size to cause any noticeable interference with the natural flow of the stream. The section is about 530 feet wide at ordinary stages. The current is very swift even at low water and is somewhat broken at places, but it is fairly satisfactory for measuring.

No discharge measurements were made at this station during 1910. The station was last visited May 25, 1909, and the accuracy of the estimates of daily and monthly discharges published in the following tables depends on the constancy of the elevation of the gage and the permanency of the relation of gage height to discharge since that date.

Daily gage height, in feet, of Little Tennessee River at McGhee, Tenn., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.3	3.7	9.1	3.3	3.8	4.5	4.4	4.4	5.6	3.3	2.5	2.5
2	3.7	3.5	8.0	3.3	3.8	4.4	5.4	4.0	4.2	3.0	2.4	2.3
3	3.9	3.6	6.8	3.3	3.6	4.5	5.2	3.8	4.0	2.9	2.4	2.3
4	3.9	4.6	5.8	3.2	3.6	4.5	5.4	4.4	4.0	2.8	2.4	2.2
5	3.7	4.0	5.2	3.2	3.6	4.5	4.9	5.0	4.0	2.8	2.3	2.7
6	3.6	3.8	4.9	3.2	3.5	9.5	4.9	4.3	3.6	2.7	2.5	10.0
7	6.6	3.5	4.7	3.4	3.5	6.8	6.8	4.6	3.6	2.6	2.5	5.9
8	6.4	3.3	4.4	3.1	4.2	5.6	6.4	4.3	3.4	3.7	2.4	4.0
9	5.0	3.6	4.3	3.1	8.6	5.1	5.6	4.0	3.3	3.6	2.4	3.7
10	4.5	3.8	4.1	3.1	6.2	4.8	5.2	3.8	3.3	3.6	2.4	3.6
11	4.1	3.6	4.3	3.1	5.2	5.0	4.8	3.7	3.2	3.1	2.4	3.3
12	3.9	4.0	4.5	3.1	4.7	4.9	4.7	3.6	3.2	3.0	2.4	3.1
13	3.8	3.7	4.2	3.3	5.0	5.1	4.6	3.5	3.1	2.9	2.4	3.0
14	3.7	3.4	4.1	3.5	4.5	5.4	5.6	3.5	3.1	2.8	2.4	2.9
15	4.0	3.6	3.9	3.3	4.2	4.9	5.4	3.4	3.0	2.7	2.3	2.8
16	3.6	3.7	3.8	3.3	4.1	4.9	5.0	3.4	3.0	2.7	2.3	2.7
17	3.5	4.0	3.8	4.1	4.2	4.7	5.0	3.4	2.9	2.7	2.3	2.6
18	3.5	8.8	3.7	7.1	4.7	4.5	5.2	3.3	2.9	2.6	2.3	2.9
19	4.8	6.8	3.7	4.8	6.1	4.3	4.8	3.3	2.8	2.6	2.3	2.8
20	4.3	5.5	3.6	4.2	5.1	4.2	4.3	4.0	2.9	2.6	2.3	2.8
21	4.6	4.8	3.8	4.0	5.5	4.5	4.2	3.7	2.9	2.6	2.2	2.8
22	5.2	5.3	3.7	3.8	5.7	4.4	4.1	3.6	2.8	2.5	2.2	2.7
23	4.8	5.0	3.7	3.8	5.9	4.4	4.0	3.5	2.8	2.5	2.3	2.7
24	4.4	4.6	3.6	4.0	5.7	4.4	3.8	3.5	2.8	2.5	2.4	3.3
25	4.3	4.4	3.6	3.7	8.5	4.5	3.8	3.3	2.7	2.5	2.4	4.0
26	4.1	4.2	3.5	3.7	7.4	4.4	3.7	3.2	3.1	2.4	2.5	3.6
27	4.1	4.0	3.5	3.8	6.2	4.1	4.4	3.4	3.0	2.4	2.4	3.2
28	4.1	4.3	3.4	4.2	5.5	3.9	4.3	3.4	2.9	2.7	2.6	3.1
29	3.9	.....	3.4	4.1	5.1	4.2	4.2	3.3	2.9	2.8	3.6	3.1
30	3.9	.....	3.4	3.9	4.9	5.5	4.0	3.2	3.3	2.6	3.1	3.4
31	3.8	.....	3.3	.....	5.1	.....	4.7	3.0	.....	2.5	.....	4.7

NOTE.—Gage heights probably not affected by ice.

Daily discharge, in second-feet, of Little Tennessee River at McGhee, Tenn., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,650	4,630	21,200	3,650	4,890	6,780	6,500	6,500	10,000	3,650	2,090	2,090
2	4,630	4,130	17,500	3,650	4,890	6,500	9,420	5,410	5,950	2,990	1,940	1,790
3	5,150	4,380	13,700	3,650	4,380	6,780	8,820	4,890	5,410	2,790	1,940	1,790
4	5,150	7,060	10,600	3,420	4,380	6,780	9,420	6,500	5,410	2,600	1,940	1,650
5	4,630	5,410	8,820	3,420	4,380	6,780	7,930	8,220	5,410	2,600	1,790	2,420
6	4,380	4,890	7,930	3,420	4,130	22,500	7,930	6,220	4,380	2,420	2,090	24,200
7	13,100	4,130	7,350	3,890	4,130	13,700	13,700	7,060	4,380	2,250	2,090	10,900
8	12,500	3,650	6,500	3,200	5,950	10,000	12,500	6,220	3,890	4,630	1,940	5,410
9	8,220	4,380	6,220	3,200	19,500	8,520	10,000	5,410	3,650	4,380	1,940	4,630
10	6,780	4,890	5,680	3,200	11,800	7,640	8,820	4,890	3,650	4,380	1,940	4,380
11	5,680	4,380	6,220	3,200	8,820	8,220	7,640	4,630	3,420	3,200	1,940	3,650
12	5,150	5,410	6,780	3,200	7,350	7,930	7,350	4,380	3,420	2,990	1,940	3,200
13	4,890	4,630	5,950	3,650	8,220	8,520	7,060	4,130	3,200	2,790	1,940	2,990
14	4,630	3,890	5,680	4,130	6,780	9,420	10,000	4,130	3,200	2,600	1,940	2,790
15	5,410	4,380	5,150	3,650	5,950	7,930	9,420	3,890	2,990	2,420	1,790	2,600
16	4,380	4,630	4,890	3,650	5,680	7,930	8,220	3,890	2,990	2,420	1,790	2,420
17	4,130	5,410	4,890	5,680	5,950	7,350	8,220	3,890	2,790	2,420	1,790	2,250
18	4,130	20,200	4,630	14,600	7,350	6,780	8,820	3,650	2,790	2,250	1,790	2,790
19	7,640	13,700	4,630	7,640	11,500	6,220	7,640	3,650	2,600	2,250	1,790	2,600
20	6,220	9,720	4,380	5,950	8,520	5,950	6,220	5,410	2,790	2,250	1,790	2,600
21	7,060	7,640	4,890	5,410	9,720	6,780	5,950	4,630	2,790	2,250	1,650	2,600
22	8,820	9,120	4,630	4,890	10,300	6,500	5,680	4,380	2,600	2,090	1,650	2,420
23	7,640	8,220	4,630	4,890	10,900	6,500	5,410	4,130	2,600	2,090	1,790	2,420
24	6,500	7,060	4,380	5,410	10,300	6,500	4,890	4,130	2,600	2,090	1,940	3,650
25	6,220	6,500	4,380	4,630	19,200	6,780	4,890	3,650	2,420	2,090	1,940	5,410
26	5,680	5,950	4,130	4,630	15,600	6,500	4,630	3,420	3,200	1,940	2,090	4,380
27	5,680	5,410	4,130	4,890	11,800	5,680	6,500	3,890	2,990	1,940	1,940	3,420
28	5,680	6,220	3,890	5,950	9,720	5,150	6,220	3,890	2,790	2,420	2,250	3,200
29	5,150	.....	3,890	5,680	8,520	5,950	5,950	3,650	2,790	2,600	4,380	3,200
30	5,150	.....	3,890	5,150	7,930	9,720	5,410	3,420	3,650	2,250	3,200	3,890
31	4,890	.....	3,650	.....	8,520	.....	7,350	2,990	.....	2,090	.....	7,350

NOTE.—Daily discharge determined by means of a discharge rating curve fairly well defined between 1,390 and 1,650 second-feet (gage heights 2.0 and 2.2 feet), well defined between 1,790 and 8,820 second-feet (gage heights 2.3 and 5.2 feet), and fairly well defined between 9,120 and 24,200 second-feet (gage heights 5.3 and 10.0 feet).

Monthly discharge of Little Tennessee River at McGhee, Tenn., for 1910.

[Drainage area, 2,470 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	13,100	3,650	6,090	2.47	2.85	A.
February	20,200	3,650	6,430	2.60	2.71	A.
March	21,200	3,650	6,620	2.68	3.09	A.
April	14,600	3,200	4,720	1.91	2.13	A.
May	19,500	4,130	8,610	3.49	4.02	A.
June	22,500	5,150	7,940	3.21	3.58	A.
July	13,700	4,630	7,690	3.12	3.60	A.
August	8,220	2,990	4,680	1.89	2.18	A.
September	10,000	2,420	3,690	1.49	1.66	A.
October	4,630	1,940	2,650	1.07	1.23	A.
November	4,380	1,650	2,030	.822	.92	A.
December	24,200	1,650	4,160	1.68	1.94	A.
The year	24,200	1,650	5,450	2.21	29.91	

TUCKASEGEE RIVER AT BRYSON, N. C.

This station is located at the highway bridge in the town of Bryson, N. C., one-half mile below the mouth of Deep Creek and about 15 miles above the junction of Tuckasegee River with Little Tennessee

River. Oconalufty River, an important tributary, comes in about 8 miles above Bryson. The total drainage area above the station is 662 square miles.

The original station was established in June, 1896, at the Southern Railway bridge, 3 miles above Bryson, but was abandoned early in 1897 on account of poor measuring section. The present station was established November 7, 1897, and has been maintained continuously since that time.

The gage is read twice a day in order to equalize any small variations in flow caused by the operations of power plants.

Discharge measurements are made at the bridge, where the current and other conditions are good. A staff gage is attached to the left bank pier. Its datum has not been changed.

Discharge measurements of Tuckasegee River at Bryson, N. C., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 20	F. P. Thomas	191	975	2.00	1,700
21	do	191	961	1.90	1,560
21	do	191	956	1.91	1,580
Nov. 17	M. R. Hall	185	760	1.12	542

Daily gage height, in feet, of Tuckasegee River at Bryson, N. C., for 1910.

[J. M. Welch, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	1.5	3.85	1.5	1.6	2.0	1.9	1.8	2.2	1.5	1.2	1.1
2	1.7	1.5	3.1	1.5	1.6	1.9	1.95	1.8	2.0	1.4	1.2	1.1
3	1.8	1.6	2.65	1.5	1.5	2.25	1.85	2.0	1.9	1.3	1.2	1.1
4	1.75	1.7	2.5	1.5	1.7	2.15	1.95	2.0	1.9	1.3	1.2	1.15
5	1.6	1.6	2.3	1.45	1.5	3.0	2.1	1.85	1.85	1.3	1.2	2.1
6	1.65	1.55	2.2	1.55	1.5	3.25	2.3	1.8	1.7	1.3	1.2	3.4
7	3.3	1.6	2.1	1.4	1.6	2.55	2.95	1.8	1.65	1.95	1.2	1.9
8	2.45	1.5	2.0	1.4	3.35	2.35	2.4	1.8	1.6	1.95	1.2	1.6
9	2.0	1.65	2.0	1.4	3.55	2.2	2.2	1.8	1.7	1.9	1.2	1.5
10	1.95	1.65	1.95	1.4	2.7	2.1	2.25	1.7	1.5	1.6	1.2	1.5
11	1.8	1.6	2.2	1.4	2.15	2.0	2.15	1.6	1.5	1.5	1.2	1.5
12	1.75	1.6	2.0	1.6	2.2	2.2	2.1	1.6	1.5	1.4	1.15	1.4
13	1.7	1.45	1.9	1.5	2.05	2.25	2.45	1.5	1.5	1.4	1.15	1.3
14	1.75	1.5	1.8	1.5	1.9	2.55	2.65	1.6	1.45	1.35	1.15	1.2
15	1.7	1.5	1.8	1.5	1.8	2.6	2.75	1.55	1.4	1.3	1.15	1.3
16	1.6	1.7	1.7	1.8	1.8	2.4	2.65	1.5	1.5	1.3	1.15	1.4
17	1.6	2.15	1.7	3.8	1.95	2.25	2.5	1.5	1.4	1.3	1.1	1.35
18	1.7	3.65	1.7	2.85	2.7	2.1	2.35	1.5	1.35	1.3	1.15	1.3
19	1.9	2.45	1.7	1.95	2.25	2.0	2.2	1.7	1.35	1.3	1.1	1.4
20	2.05	2.2	1.8	1.8	2.5	2.1	2.05	1.7	1.4	1.25	1.1	1.3
21	2.2	2.2	1.7	1.7	2.4	2.15	1.9	1.6	1.35	1.25	1.1	1.15
22	1.95	2.25	1.7	1.65	2.45	2.1	1.85	1.65	1.3	1.25	1.1	1.2
23	1.8	2.05	1.65	1.7	2.4	2.1	1.8	1.55	1.3	1.2	1.1	1.4
24	1.8	2.0	1.6	1.6	3.1	2.15	1.8	1.5	1.3	1.2	1.15	2.4
25	1.8	1.9	1.6	1.6	3.35	2.0	1.8	1.5	1.5	1.2	1.2	1.6
26	1.7	1.9	1.6	1.6	2.9	2.0	1.7	1.6	1.4	1.2	1.15	1.45
27	1.7	1.9	1.55	1.7	2.55	1.85	2.15	1.65	1.4	1.25	1.2	1.5
28	1.7	3.1	1.55	1.6	2.35	1.9	2.05	1.5	1.4	1.35	1.55	1.45
29	1.65	.....	1.55	1.6	2.2	1.9	2.0	1.4	1.4	1.25	1.35	1.5
30	1.6	.....	1.5	1.6	2.45	1.9	2.35	1.4	1.65	1.2	1.2	2.75
31	1.6	.....	1.5	.....	2.15	.....	1.95	2.7	.....	1.2	.....	1.9

Daily discharge, in second-feet, of Tuckasegee River at Bryson, N. C., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,090	960	5,420	960	1,090	1,660	1,510	1,360	1,970	960	625	530
2	1,220	960	3,670	960	1,090	1,510	1,580	1,360	1,660	840	625	530
3	1,360	1,090	2,760	960	960	2,050	1,440	1,660	1,510	730	625	530
4	1,300	1,220	2,480	960	1,220	1,890	1,580	1,660	1,510	730	625	578
5	1,090	1,090	2,130	900	960	3,460	1,810	1,440	1,440	730	625	1,810
6	1,160	1,020	1,970	900	960	4,000	2,130	1,360	1,220	730	625	4,330
7	4,110	1,090	1,810	840	1,090	2,570	3,360	1,360	1,160	1,580	625	1,510
8	2,390	960	1,660	840	4,220	2,220	2,300	1,360	1,090	1,580	625	1,090
9	1,660	1,160	1,660	840	4,680	1,970	1,970	1,360	1,220	1,510	625	960
10	1,580	1,160	1,580	840	2,850	1,810	2,050	1,220	960	1,090	625	960
11	1,360	1,090	1,970	840	1,890	1,660	1,890	1,090	960	960	625	960
12	1,300	1,090	1,660	1,090	1,970	1,970	1,810	1,090	960	840	578	840
13	1,220	900	1,510	960	1,740	2,050	2,390	960	960	840	578	730
14	1,300	960	1,360	960	1,510	2,570	2,760	1,090	900	785	578	625
15	1,220	960	1,360	960	1,360	2,660	2,950	1,020	840	730	578	730
16	1,090	1,220	1,220	1,360	1,360	2,300	2,760	960	960	730	578	840
17	1,090	1,890	1,220	5,290	1,580	2,050	2,480	960	840	730	530	785
18	1,220	4,920	1,220	3,150	2,850	1,810	2,220	960	785	730	578	730
19	1,510	2,390	1,220	1,580	2,050	1,660	1,970	1,220	785	730	530	840
20	1,740	1,970	1,360	1,360	2,480	1,810	1,740	1,220	840	678	530	730
21	1,970	1,970	1,220	1,220	2,300	1,890	1,510	1,090	785	678	530	578
22	1,580	2,050	1,220	1,100	2,390	1,810	1,440	1,160	730	678	530	625
23	1,360	1,740	1,160	1,220	2,300	1,810	1,360	1,020	730	625	530	840
24	1,360	1,660	1,090	1,090	3,670	1,890	1,360	960	730	625	578	2,300
25	1,360	1,510	1,090	1,090	4,220	1,660	1,360	960	960	625	625	1,090
26	1,220	1,510	1,090	1,090	3,250	1,660	1,220	1,090	840	625	578	900
27	1,220	1,510	1,020	1,220	2,570	1,440	1,890	1,160	840	678	625	960
28	1,220	3,670	1,020	1,090	2,220	1,510	1,740	960	840	785	1,020	900
29	1,160	.....	1,020	1,090	1,970	1,510	1,660	840	840	678	785	960
30	1,090	.....	960	1,090	2,390	1,510	2,220	840	1,160	625	625	2,950
31	1,090	.....	960	.....	1,890	.....	1,580	2,850	.....	625	.....	1,510

NOTE.—Daily discharge determined from a discharge rating curve well defined between 530 and 3,250 second-feet (gage heights 1.1 and 2.9 feet), and fairly well defined between 3,460 and 10,700 second-feet (gage heights 3.0 and 5.5 feet).

Monthly discharge of Tuckasegee River at Bryson, N. C., for 1910.

[Drainage area, 662 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	4,110	1,090	1,440	2.18	2.51	A.
February	4,920	900	1,560	2.36	2.46	A.
March	5,420	960	1,650	2.49	2.87	A.
April	5,290	840	1,260	1.90	2.12	A.
May	4,680	960	2,160	3.26	3.76	A.
June	4,000	1,440	2,010	3.04	3.39	A.
July	3,360	1,220	1,940	2.93	3.38	A.
August	2,850	840	1,210	1.83	2.11	A.
September	1,970	730	1,030	1.56	1.74	A.
October	1,580	625	822	1.24	1.43	A.
November	1,020	530	612	.924	1.03	A.
December	4,330	530	1,100	1.66	1.91	A.
The year	5,420	530	1,400	2.11	28.71	

HIWASSEE RIVER BASIN.

GENERAL FEATURES.

Hiwassee River rises in the mountains of the Blue Ridge in western North Carolina and northern Georgia, takes a northwesterly direction, breaks through the Unaka Mountains, and enters Tennessee River 36 miles above Chattanooga, after flowing for 41 miles through a level country.

Nottely and Ocoee rivers, important tributaries, head in the Blue Ridge in Georgia. The Nottely enters the Hiwassee a short distance below Murphy, N. C., but the Ocoee has cut for itself a separate channel through the mountain border and enters the Hiwassee about 6 miles below Savannah Ford, which is the head of navigation. The lower mountain channels of both Hiwassee and Ocoee are exceedingly narrow, with high, precipitous banks, and the fall of both streams is very large.

The Hiwassee River basin occupies the southwestern portion of the Appalachian Mountains northwest of the Blue Ridge, and is therefore the southern extremity of the great mountain drainage area whose southeastern border is the top of the Blue Ridge, extending solid without a single crosscutting stream south of Roanoke River in Virginia.

The altitude of this tract, separated from the Little Tennessee basin by a mountainous divide, extending from the Blue Ridge to the Unaka Mountains, ranges between 1,500 and 5,000 feet. Spurs from 5 to 20 miles long reach from the eastern divide toward the river, and deep valleys extend from the river far into the mountains. The mountain sides are steep and in many places rocky, and the creek valleys, several of which are important, have considerable areas of alluvial flats and rolling foothills.

HIWASSEE RIVER AT MURPHY, N. C.

This station, which is located at the highway bridge in Murphy, N. C., about 80 feet above the Louisville & Nashville Railroad bridge, one-half mile above the mouth of Valley River, was established July 26, 1896, and the record is continuous except for a short period from August 8 to October 19, 1897.

The total drainage area above the station is 410 square miles. The natural flow is little, if any, affected either by diversions or dams above.

Prior to 1903 a wire gage located at the bridge was used. This was broken a number of times, introducing uncertainties in the gage height records. Since January 1, 1903, a chain gage fastened to the bridge

has been used. There has been no change in the gage datum since October 20, 1897. At the measuring section the current is good and fairly regular, but the bed, which is rock, is uneven, and soundings require careful work. Backwater from Valley River is not apt to disturb the rating, though such an effect is possible.

Discharge measurements of Hiwassee River at Murphy, N. C., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 19	M. R. Hall	157	385	5.81	800
19	F. P. Thomas	157	395	5.82	804
22	do	161	412	5.75	806
Nov. 16	M. R. Hall	150	267	5.15	287
16	do	150	254	5.14	282

Daily gage height, in feet, of Hiwassee River at Murphy, N. C., for 1910.

[Miss Willie Mingus, observer.]

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.6	5.7	7.0	5.45	5.65	6.1	6.2	5.7	6.1	5.35	5.2	5.15
2	5.6	5.65	8.0	5.5	5.6	6.0	6.25	5.6	6.0	5.3	5.2	5.15
3	5.7	5.7	6.6	5.45	5.6	6.1	6.2	5.65	5.65	5.25	5.2	5.15
4	5.6	6.0	6.3	5.45	5.6	6.0	6.4	5.55	5.65	5.25	5.2	5.15
5	5.6	5.85	6.25	5.5	5.55	6.2	6.2	5.85	5.8	5.25	5.2	5.75
6	5.6	5.8	6.15	5.6	5.5	7.7	7.0	5.6	5.55	5.25	5.2	8.0
7	7.6	5.7	6.0	5.5	5.6	6.7	6.7	6.0	5.5	5.35	5.2	6.2
8	6.6	5.8	5.95	5.45	8.4	6.45	6.15	5.9	5.45	5.5	5.2	6.2
9	6.2	5.7	5.85	5.45	7.8	6.3	6.4	5.6	5.45	5.75	5.2	5.6
10	6.0	5.7	5.85	5.45	6.75	6.3	6.2	5.55	5.4	5.45	5.2	5.55
11	5.9	5.65	6.1	5.45	6.5	6.35	6.3	5.55	5.4	5.35	5.2	5.5
12	5.8	5.9	6.0	5.45	6.25	6.2	6.5	5.5	5.4	5.3	5.2	5.4
13	5.7	5.7	5.9	5.6	6.2	6.5	6.3	5.5	5.7	5.3	5.15	5.3
14	5.8	5.65	5.85	5.6	6.05	6.3	6.2	5.5	5.4	5.2	5.15	5.3
15	5.7	5.7	5.75	5.45	6.05	6.4	6.15	5.7	5.4	5.25	5.15	5.3
16	5.65	5.75	5.75	5.6	5.8	6.75	6.0	5.5	5.4	5.25	5.15	5.3
17	5.65	5.8	5.7	7.0	6.0	6.2	6.0	5.45	5.3	5.25	5.15	5.3
18	5.6	7.6	5.7	5.6	6.2	6.1	5.95	5.5	5.3	5.2	5.15	5.3
19	6.05	6.65	5.65	6.0	6.2	6.0	5.85	5.6	5.3	5.2	5.15	5.4
20	5.7	6.4	5.8	5.9	5.8	5.9	5.8	5.9	5.3	5.2	5.15	5.3
21	6.3	6.2	5.7	5.8	8.4	6.35	5.8	5.55	5.3	5.2	5.15	5.3
22	6.2	6.3	5.65	5.7	7.4	6.15	5.8	5.5	5.25	5.2	5.15	5.3
23	6.0	6.15	5.6	5.75	7.2	6.25	5.7	5.7	5.25	5.2	5.15	5.35
24	6.0	6.1	5.6	5.65	7.0	6.2	5.95	5.5	5.35	5.2	5.2	5.95
25	5.9	6.0	5.6	5.6	7.8	6.15	5.95	5.5	5.55	5.2	5.2	5.55
26	5.85	5.9	5.55	5.75	7.0	6.0	5.9	5.6	5.55	5.15	5.2	5.45
27	5.85	5.9	5.55	5.75	6.8	5.9	5.9	5.5	5.5	5.15	5.15	5.45
28	5.8	6.0	5.5	5.7	6.55	5.8	6.0	5.5	5.35	5.4	5.5	5.4
29	5.9	.....	5.5	5.7	6.4	6.0	5.95	5.45	5.3	5.25	5.3	5.4
30	5.8	.....	5.45	5.7	6.3	5.9	5.95	5.4	5.4	5.2	5.2	5.8
31	5.75	.....	5.45	.....	6.2	.....	5.8	5.55	.....	5.2	.....	5.75

Daily discharge, in second-feet, of Hiwassee River at Murphy, N. C., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	640	720	2,130	512	670	1,070	1,170	710	1,070	438	330	295
2	640	680	3,850	550	630	975	1,220	630	975	400	330	295
3	720	720	1,610	512	630	1,070	1,170	670	670	365	330	295
4	640	975	1,270	512	630	975	1,380	590	670	365	330	295
5	640	842	1,220	550	590	1,170	1,170	840	795	365	330	752
6	640	800	1,120	630	550	3,290	2,130	630	590	365	330	3,850
7	3,110	720	975	550	630	1,730	1,730	975	550	438	330	1,170
8	1,610	800	930	512	4,660	1,440	1,120	885	512	550	330	1,170
9	1,170	720	840	512	3,470	1,270	1,380	630	512	752	330	630
10	975	720	840	512	1,800	1,270	1,170	590	475	512	330	590
11	885	680	1,070	512	1,490	1,320	1,270	590	475	438	330	550
12	800	885	975	512	1,220	1,170	1,490	550	475	400	330	475
13	720	720	885	630	1,170	1,490	1,270	550	710	400	295	400
14	800	680	840	630	1,020	1,270	1,170	550	475	330	295	400
15	720	720	752	512	1,020	1,380	1,120	710	475	365	295	400
16	680	760	752	630	795	1,800	975	550	475	365	295	400
17	680	800	710	2,130	975	1,170	975	512	400	365	295	400
18	640	3,110	710	630	1,170	1,070	930	550	400	330	295	400
19	1,020	1,670	670	975	1,170	975	840	630	400	330	295	475
20	720	1,380	795	885	795	885	795	885	400	330	295	400
21	1,270	1,170	710	795	4,660	1,320	795	590	400	330	295	400
22	1,170	1,270	670	710	2,760	1,020	795	550	365	330	295	400
23	975	1,120	630	752	2,430	1,220	710	710	365	330	295	438
24	975	1,070	630	670	2,130	1,170	930	550	438	330	330	930
25	885	975	630	630	3,470	1,120	930	550	590	330	330	590
26	842	885	590	752	2,130	975	885	630	590	295	330	512
27	842	885	590	752	1,860	885	885	550	550	295	295	512
28	800	975	550	710	1,550	795	975	550	438	475	550	475
29	885	.....	550	710	1,380	975	930	512	400	365	400	475
30	800	.....	512	710	1,270	885	930	475	475	330	330	795
31	760	.....	512	.....	1,170	.....	795	590	.....	330	.....	752

NOTE.—Daily discharge determined from rating curves well defined between 260 and 1,860 second-feet (gage heights 5.1 and 6.8 feet), fairly well defined between 1,990 and 3,850 second-feet (gage heights 6.9 and 8.0 feet), and poorly defined above 3,850 second-feet (gage height 8.0 feet). The rating curve used below discharge 885 second-feet (gage height 5.9 feet), from Jan. 1 to Feb. 28, differed from that used Mar. 1 to Dec. 31. The necessity for this change in rating was shown by discharge measurements made during 1909 and 1910.

Monthly discharge of Hiwassee River at Murphy, N. C., for 1910.

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	3,110	640	924	2.25	2.59	B.
February	3,110	680	980	2.39	2.48	B.
March	3,850	512	952	2.32	2.68	B.
April	2,130	512	686	1.67	1.86	B.
May	4,660	550	1,610	3.93	4.53	B.
June	3,290	795	1,240	3.02	3.37	A.
July	2,130	710	982	2.40	2.77	A.
August	975	475	629	1.53	1.76	A.
September	1,070	365	537	1.31	1.46	A.
October	752	295	385	.939	1.08	A.
November	550	295	326	.795	.89	A.
December	3,850	295	643	1.57	1.81	A.
The year	4,660	295	824	2.01	27.29	

HIWASSEE RIVER AT RELIANCE, TENN.

This station, which is located at the Louisville & Nashville Railroad bridge at Reliance, Tenn., 2 miles above Spring Creek and 1 mile below Lost Creek, was established August 17, 1900.

The total drainage area above the station is 1,180 square miles.

At ordinary stages the section is a fairly good one. The water is held back by a ledge of rock below and is rather sluggish at low stages. At one end of this ledge is a small corn mill, but it does not appear probable that the use of water power by this mill could affect the gage readings. It is possible, however, that at low water there is some effect, and also that the observed changes in rating may be due to variable heights of the temporary dam at the mill.

There has been no change in the datum of the staff gage, which is attached to a tree at the right ferry landing 150 feet above the bridge.

Discharge measurements of Hiwassee River at Reliance, Tenn., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 11	M. R. Hall	335	2,140	2.16	2,570
11	do	336	2,190	2.20	2,720
July 25	F. P. Thomas	344	2,110	2.09	2,320
25	do	344	2,110	2.01	2,230
26	do	344	2,130	1.97	2,220

Daily gage height, in feet, of Hiwassee River at Reliance, Tenn., for 1910.

[C. V. Higdon, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.9	1.85	3.2	1.6	1.85	2.3	2.45	2.0	3.2	1.45	1.3	1.3
2	1.8	1.8	3.5	1.6	1.8	2.2	2.55	1.9	2.65	1.45	1.3	1.25
3	1.9	1.85	3.0	1.6	1.75	2.6	2.45	1.9	2.2	1.4	1.3	1.2
4	1.8	2.0	2.7	1.6	1.7	2.35	2.9	1.95	2.1	1.4	1.25	1.2
5	1.75	2.3	2.5	1.55	1.7	2.5	2.7	2.6	2.05	1.35	1.25	1.6
6	1.7	2.0	2.25	1.6	1.75	4.2	2.7	2.6	1.9	1.35	1.3	6.4
7	2.7	1.9	2.25	1.6	1.8	3.3	3.4	2.0	1.75	1.45	1.3	2.9
8	2.95	1.85	2.15	1.55	4.2	2.7	3.2	3.5	1.7	1.45	1.3	2.4
9	2.5	1.8	2.1	1.5	4.9	2.65	3.0	2.5	1.7	1.65	1.3	1.9
10	2.2	1.8	2.05	1.5	4.4	2.5	2.7	2.2	1.7	1.65	1.25	1.8
11	2.05	2.0	2.1	1.5	2.85	2.75	2.6	2.05	1.7	1.6	1.25	1.7
12	1.95	2.15	2.3	1.5	2.55	2.65	2.55	2.95	1.6	1.45	1.25	1.6
13	1.85	2.0	2.1	1.6	2.4	3.1	2.6	1.95	1.65	1.4	1.25	1.55
14	1.8	1.85	2.0	1.75	2.3	2.8	2.7	2.5	1.65	1.4	1.25	1.5
15	1.9	1.85	1.95	1.65	2.2	2.8	2.6	1.9	1.55	1.35	1.25	1.5
16	1.8	1.85	1.85	1.9	2.1	2.8	2.6	1.9	1.5	1.35	1.25	1.55
17	1.8	1.9	1.95	2.9	2.2	2.4	2.45	1.95	1.4	1.3	1.25	1.45
18	1.7	4.1	1.85	3.3	2.4	2.35	2.35	1.85	1.4	1.3	1.2	1.45
19	2.05	3.2	1.8	2.75	2.5	2.3	2.25	1.8	1.45	1.3	1.25	1.55
20	2.0	2.65	1.8	2.2	2.6	2.35	2.25	2.0	1.45	1.3	1.2	1.5
21	2.1	2.45	1.85	2.0	4.6	2.35	2.25	2.0	1.45	1.3	1.2	1.45
22	2.55	2.4	1.8	1.9	3.9	2.25	2.1	1.85	1.45	1.35	1.2	1.45
23	2.25	2.4	1.8	1.9	3.9	2.35	2.05	1.8	1.4	1.25	1.2	1.45
24	2.25	2.3	1.75	1.9	4.1	2.4	2.05	1.8	1.4	1.25	1.25	1.6
25	2.2	2.15	1.75	1.9	4.9	2.5	2.1	1.8	1.4	1.25	1.3	1.9
26	2.1	2.1	1.75	1.95	3.7	2.3	2.0	1.75	1.5	1.25	1.3	1.4
27	2.05	2.15	1.7	2.0	3.2	2.1	2.15	1.8	1.5	1.25	1.25	1.3
28	2.0	2.0	1.7	2.1	2.85	2.05	2.2	1.8	1.6	1.35	1.55	1.6
29	2.0	.....	1.7	2.0	2.65	2.65	2.5	1.75	1.55	1.35	1.6	1.6
30	1.95	.....	1.65	1.9	2.5	2.6	2.4	1.65	1.5	1.35	1.4	1.8
31	1.9	.....	1.6	.....	2.45	.....	2.25	1.7	.....	1.35	.....	2.2

Daily discharge, in second-feet, of Hiwassee River at Reliance, Tenn., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,050	1,940	5,560	1,450	1,940	2,950	3,330	2,260	5,560	1,190	960	960
2	1,840	1,840	6,590	1,450	1,840	2,710	3,600	2,050	3,870	1,190	960	890
3	2,050	1,940	4,910	1,450	1,740	3,730	3,330	2,050	2,710	1,110	960	820
4	1,840	2,260	4,010	1,450	1,640	3,080	4,600	2,160	2,480	1,110	890	820
5	1,740	2,950	3,460	1,360	1,640	3,460	4,010	3,730	2,370	1,040	890	1,450
6	1,640	2,260	2,830	1,450	1,740	9,160	4,010	3,730	2,050	1,040	960	18,500
7	4,010	2,050	2,830	1,450	1,840	5,900	6,240	2,260	1,740	1,190	960	4,600
8	4,760	1,940	2,600	1,360	9,160	4,010	5,560	6,590	1,640	1,190	960	3,200
9	3,460	1,840	2,480	1,270	12,000	3,870	4,910	3,460	1,640	1,540	960	2,050
10	2,710	1,840	2,370	1,270	9,940	3,460	4,010	2,710	1,640	1,540	890	1,840
11	2,370	2,260	2,480	1,270	4,450	4,160	3,730	2,370	1,640	1,450	890	1,640
12	2,160	2,600	2,950	1,270	3,600	3,870	3,600	4,760	1,450	1,190	890	1,450
13	1,940	2,260	2,480	1,450	3,200	5,230	3,730	2,160	1,540	1,110	890	1,360
14	1,840	1,940	2,260	1,740	2,950	4,300	4,010	3,460	1,540	1,110	890	1,270
15	2,050	1,940	2,160	1,540	2,710	4,300	3,730	2,050	1,360	1,040	890	1,270
16	1,840	1,940	1,940	2,050	2,480	4,300	3,730	2,050	1,270	1,040	890	1,360
17	1,840	2,050	2,160	4,600	2,710	3,200	3,330	2,160	1,110	960	890	1,190
18	1,640	8,780	1,940	5,900	3,200	3,080	3,080	1,940	1,110	960	820	1,190
19	2,370	5,560	1,840	4,160	3,460	2,950	2,830	1,840	1,190	960	890	1,360
20	2,260	3,870	1,840	2,710	3,730	3,080	2,830	2,260	1,190	960	820	1,270
21	2,480	3,330	1,940	2,260	10,700	3,080	2,830	2,260	1,190	960	820	1,190
22	3,600	3,200	1,840	2,050	8,030	2,830	2,480	1,940	1,190	1,040	820	1,190
23	2,830	3,200	1,840	2,050	8,030	3,080	2,370	1,840	1,110	890	820	1,190
24	2,830	2,950	1,740	2,050	8,780	3,200	2,370	1,840	1,110	890	890	1,450
25	2,710	2,600	1,740	2,050	12,000	3,460	2,480	1,840	1,110	890	960	2,050
26	2,480	2,480	1,740	2,160	7,300	2,950	2,260	1,740	1,270	890	960	1,110
27	2,370	2,600	1,640	2,260	5,560	2,480	2,600	1,840	1,270	890	890	960
28	2,260	2,260	1,640	2,480	4,450	2,370	2,710	1,840	1,450	1,040	1,360	1,450
29	2,260	.....	1,640	2,260	3,870	3,870	3,460	1,740	1,360	1,040	1,450	1,450
30	2,160	.....	1,540	2,050	3,460	3,730	3,200	1,540	1,270	1,040	1,110	1,840
31	2,050	.....	1,450	.....	3,330	.....	2,830	1,640	.....	1,040	.....	2,710

NOTE.—Daily discharge determined from rating curve fairly well defined between 820 and 6,240 second-feet (gage heights 1.2 and 3.4 feet), and poorly defined between 6,590 and 18,900 second-feet (gage heights 3.5 and 6.5 feet).

Monthly discharge of Hiwassee River at Reliance, Tenn., for 1910.

[Drainage area, 1,180 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	4,760	1,640	2,400	2.03	2.34	A.
February	8,780	1,840	2,740	2.32	2.42	A.
March	6,590	1,450	2,530	2.14	2.47	A.
April	5,900	1,270	2,080	1.76	1.96	A.
May	12,000	1,640	4,890	4.14	4.77	A.
June	9,160	2,370	3,730	3.16	3.53	A.
July	6,240	2,260	3,480	2.95	3.40	A.
August	6,590	1,540	2,460	2.08	2.40	A.
September	5,560	1,110	1,710	1.45	1.62	A.
October	1,540	890	1,080	.916	1.06	B.
November	1,450	820	941	.797	.89	B.
December	18,500	820	2,100	1.78	2.05	B.
The year	18,500	820	2,510	2.13	28.90	

OCOEE RIVER AT COPPERHILL, TENN.[1]

This station, which is located at a suspension footbridge just below McCay's ferry at Copperhill, Tenn., near the Georgia-Tennessee boundary, half a mile below the Louisville & Nashville Railroad

[1] The name of this town was formerly McCays.

bridge, and half a mile above the mouth of Fightingtown Creek, was established March 21, 1903.

The total drainage area above the station is 374 square miles.

Gage readings are made twice a day in order to equalize fluctuations due to mills above, which, however, are very slight.

No change has occurred in the datum of the staff gage, which is located at the right end of the bridge. The lower section is a sloping timber.

Discharge measurements are made from the suspension footbridge, where the section is excellent.

Swinging or shaking of the bridge during discharge measurements may cause some error, but this is not thought to be serious.

Discharge measurements of Ocoee River at Copperhill, Tenn., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 9	M. R. Hall	153	460	1.25	631
10	do	153	464	1.25	676
July 22	F. P. Thomas	153	591	1.65	915
23	do	153	581	1.60	909
Sept. 17	M. R. Hall	140	438	1.07	534

Daily gage height, in feet, of Ocoee River at Copperhill, Tenn., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.95	0.98	2.1	0.95	1.2	1.6	2.2	1.7	4.0	1.0	0.7	1.1
2	1.0	.95	1.95	.9	1.05	1.6	2.4	1.7	3.1	.95	.7	1.0
3	1.0	.98	1.75	.9	1.0	3.1	3.3	1.5	2.8	.9	.7	.....
4	.9	1.2	1.5	.9	1.0	2.1	2.95	2.2	1.5	.95	.7	.....
5	.85	1.0	1.5	.9	1.0	3.5	2.8	2.55	1.4	1.0	.7	.....
6	1.45	.95	1.4	.98	1.0	3.7	2.7	2.1	1.4	1.2	.7	.....
7	2.65	.9	1.4	.9	1.3	2.55	2.8	2.5	1.4	1.4	.7	.....
8	2.45	.9	1.3	.88	3.2	2.15	2.7	2.1	1.3	1.2	.7	.....
9	1.8	.95	1.25	.85	2.95	2.0	2.85	1.9	1.3	1.15	.65	.....
10	1.2	1.0	1.4	.85	1.9	2.0	2.7	1.65	1.3	1.15	.65	.....
11	1.05	1.1	1.6	.85	1.25	3.2	2.3	1.8	1.2	1.05	.6	.....
12	1.0	1.4	1.4	.85	1.7	3.0	2.0	1.65	1.3	.9	.6	.....
13	1.0	1.1	1.3	1.05	1.65	2.5	2.55	1.55	1.25	.95	.6	.....
14	1.0	1.1	1.25	.92	1.45	2.4	2.65	1.5	1.25	1.0	.65	.....
15	1.0	1.05	1.2	.9	1.3	2.2	2.25	1.5	1.2	.9	.65	.....
16	.9	1.0	1.15	1.2	1.35	2.1	2.25	1.5	1.2	.9	.6	.....
17	.95	1.8	1.15	3.0	1.6	2.0	2.0	1.6	1.05	.8	.65	.....
18	1.0	3.2	1.1	1.65	1.65	1.75	1.95	1.7	1.05	.8	.65	.....
19	1.1	1.7	1.1	1.25	1.6	1.7	1.9	1.3	1.05	.7	.65	.....
20	1.0	1.5	1.1	1.2	3.9	1.7	1.85	1.45	1.05	.7	.65	.....
21	1.35	1.5	1.1	1.15	4.2	2.65	1.9	1.3	1.05	.7	.65	.....
22	1.2	1.65	1.1	1.0	3.6	2.7	1.7	1.3	1.05	.7	.65	.....
23	1.2	1.5	1.05	1.0	2.75	2.75	1.6	1.5	1.05	.7	.65	.....
24	1.2	1.4	1.05	1.05	3.1	1.8	1.65	1.5	1.05	.7	.65	.....
25	1.2	1.25	1.0	1.1	3.2	2.0	1.6	1.35	1.05	.7	.65	.....
26	1.1	1.2	1.0	1.2	2.9	1.5	1.6	1.6	1.05	.65	.65	.....
27	1.1	1.2	1.0	1.2	2.75	1.6	1.8	1.9	1.0	.65	.68	.....
28	1.1	1.6	1.0	1.2	1.95	1.7	1.9	1.8	1.0	.65	1.2	.....
29	1.05	.....	1.0	1.2	1.85	2.1	3.4	1.5	1.0	.7	1.1	.....
30	1.15	.....	.95	1.2	1.8	2.05	2.55	1.4	1.55	.7	1.1	.....
31	1.0	.....	.95	.....	1.7	.....	1.6	3.2	.....	.7	.....	.....

NOTE.—Gage heights Dec. 3 to 31 are missing, as observer was unable to read gage because of fire at the ferry Dec. 2.

Daily discharge, in second-feet, of Ocoee River at Copperhill, Tenn., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	484	498	1,170	484	614	850	1,240	913	2,530	508	370	560
2	508	484	1,080	459	534	850	1,380	913	1,860	484	370	508
3	508	498	945	459	508	1,860	2,010	788	1,650	459	370	.....
4	459	614	788	459	508	1,170	1,760	1,240	788	484	370	.....
5	436	508	788	459	508	2,150	1,650	1,480	728	508	370	.....
6	758	484	728	498	508	2,300	1,580	1,170	728	614	370	.....
7	1,550	459	728	459	670	1,480	1,650	1,440	728	728	370	.....
8	1,410	459	670	450	1,940	1,210	1,580	1,170	670	614	370	.....
9	977	484	642	436	1,760	1,110	1,690	1,040	670	587	350	.....
10	614	508	728	436	1,040	1,110	1,580	882	670	587	350	.....
11	534	560	850	436	642	1,940	1,310	977	614	534	330	.....
12	508	728	728	436	913	1,790	1,110	882	670	459	330	.....
13	508	560	670	534	882	1,440	1,480	819	642	484	330	.....
14	508	560	642	469	758	1,380	1,550	788	642	508	350	.....
15	508	534	614	459	670	1,240	1,270	788	614	459	350	.....
16	459	508	587	614	699	1,170	1,270	788	614	459	330	.....
17	484	977	587	1,790	850	1,110	1,110	850	534	413	350	.....
18	508	1,940	560	882	882	945	1,080	913	534	413	350	.....
19	560	913	560	642	850	913	1,040	670	534	370	350	.....
20	508	788	560	614	2,450	913	1,010	758	534	370	350	.....
21	699	788	560	587	2,680	1,550	1,040	670	534	370	350	.....
22	614	882	560	508	2,230	1,580	913	670	534	370	350	.....
23	614	788	534	508	1,620	1,620	850	788	534	370	350	.....
24	614	728	534	534	1,860	977	882	788	534	370	350	.....
25	614	642	508	560	1,940	1,110	850	699	534	370	350	.....
26	560	614	508	614	1,720	788	850	850	534	350	350	.....
27	560	614	508	614	1,620	850	977	1,040	508	350	362	.....
28	560	850	508	614	1,080	913	1,040	977	508	350	614	.....
29	534	.....	508	614	1,010	1,170	2,080	788	508	370	560	.....
30	587	.....	484	614	977	1,140	1,480	728	819	370	560	.....
31	508	.....	484	.....	913	.....	850	1,940	.....	370	.....	.....

NOTE.—Daily discharge determined from a discharge rating curve well defined between 292 and 670 second-feet (gage heights 0.5 and 1.3 feet), fairly well defined between 728 and 2,150 second-feet (gage heights 1.4 and 3.5 feet), and poorly defined above discharge 2,150 second-feet (gage height 3.5 feet).

Monthly discharge of Ocoee River at Copperhill, Tenn., for 1910.

[Drainage area, 374 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,550	436	621	1.66	1.91	A.
February	1,940	459	678	1.81	1.88	A.
March	1,170	484	656	1.75	2.02	A.
April	1,790	436	575	1.54	1.72	A.
May	2,680	508	1,160	3.10	3.57	A.
June	2,300	788	1,290	3.45	3.85	A.
July	2,080	850	1,300	3.50	4.04	A.
August	1,940	670	942	2.52	2.90	A.
September	2,530	508	750	2.01	2.24	A.
October	728	350	453	1.21	1.40	A.
November	614	330	376	1.01	1.13	A.

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in the Allegheny River basin during 1910. The measurements and the computations of the results were made under the direction of Geo. M. Lehman, engineer in charge, Flood Commission of Pittsburgh, Pittsburgh, Pa. The results were furnished by the commission to the United States Geological Survey. The velocity determinations were made with a large Price current meter:

Miscellaneous measurements in Allegheny River basin in 1910 by representatives of the Flood Commission of Pittsburgh, Pittsburgh, Pa.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Feb. 5	Tionesta Creek	Allegheny River	Nebraska, Pa	[a] 1,081.6	494
7	do	do	do	[b] 1,081.1	341
11	do	do	do	[c] 1,081.3	326
16	do	do	do	[d] 1,081.4	434
23	do	do	do	[e] 1,083.1	775
Mar. 2	do	do	do	[f] 1,087.1	6,400
7	do	do	do	[g] 1,088.4	8,010
14	do	do	do	[h] 1,083.6	2,120
21	do	do	do	[i] 1,085.4	3,960
28	do	do	do	[j] 1,083.9	2,540
Apr. 11	do	do	do	[k] 1,080.6	201
May 7	do	do	do	[l] 1,082.6	1,220
Feb. 4	Oil Creek	do	Rouseville, Pa	1.95	572
12	do	do	do	1.30	[m] 215
22	do	do	do	1.90	[n] 665
28	do	do	do	4.80	5,390
Mar. 4	do	do	do	3.90	4,030
11	do	do	do	2.30	1,320
Apr. 7	do	do	do	1.50	326
Mar. 1	French Creek	do	Carlton, Pa	9.45	10,200
12	do	do	do	5.00	4,410
Apr. 8	do	do	do	2.00	977
May 5	do	do	do	6.60	5,660

[a] Feb. 5, regular gage 2.05 feet.
[b] Feb. 7, regular gage, 1.60 feet. Measurement affected by ice.
[c] Feb. 11, regular gage, 1.82 feet. Measurement affected by ice. Flow in mill race about 9 second-feet, not included in value given in table.
[d] Feb. 16, regular gage, 2 feet. Measurement affected by ice. Flow in mill race about 10 second-feet, not included in value given in table.
[e] Feb. 23, regular gage, 2.62 feet. Measurement affected by ice. Flow in mill race about 13 second-feet, not included in value given in table.
[f] Mar. 2, regular gage 5.68 feet. Mill race shut off.
[g] Mar. 7, regular gage 6.80 feet. Current too swift to properly place meter; above discharge probably too large.
[h] Mar. 14, regular gage 3.15 feet.
[i] Mar. 21, reading at regular gage not recorded.
[j] Mar. 28, regular gage 3.50 feet.
[k] Apr. 11, reading at permanent gage not recorded.
[l] May 7, permanent gage 2.68 feet. Mill race and log race not running.
[m] Feb. 12, measurement affected by ice.
[n] Feb. 22, measurement affected by ice.

The following miscellaneous discharge measurements were made in the Ohio River basin during 1910 by A. H. Horton, H. J. Jackson, C. T. Bailey, and J. C. Dort.

Miscellaneous measurements in Ohio River basin in 1910.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Sept 13	Raccoon Creek, Pa.	Ohio River	One mile above mouth, which is about ½ mile below Dam No. 6 on the Ohio River.	(a)	16
13	Little Beaver River	do	At highway bridge just above trolley bridge at Smiths Ferry, Ohio.	(b)	44
Oct. 22	New River	Kanawha River	At Vielé, Blackwell, and Buck's gage at Grayson, Va.	c 2.56	1,680
Nov. 29	Mohican River	Muskingum River.	At highway bridge at Greer, Ohio	(d)	609
29	do	do	Cavallo, Ohio	(e)	639
Apr. 11	Embarrass River	Wabash River	At highway bridge at north edge of Lawrenceville, Ill.	(f)	412
8	North Fork Creek	Embarrass River	At highway bridge near Oblong, Ill.	(g)	37
July 25	Cumberland River.	Ohio River	At highway bridge, at Carthage, Tenn.	h 4.88	9,650
26	do	do	do	h 4.22	8,140

a Water surface 26.84 feet below crack about 50 feet from right abutment, between two boards marked with white paint on downstream side of covered bridge.
b Water surface 46.12 feet below top of hand rail at third post from left end on downstream side of highway bridge.
c Vielé, Blackwell, and Buck's gage, about 1 mile below the railroad bridge at Fries Junction, Va.
d Water surface 21.28 feet below file mark about 2 feet above handrail on fourth upright from right end on downstream side of bridge.
e Water surface not referenced.
f Water surface 22.12 feet below top edge of lowest horizontal cross plate on right side of center vertical on downstream side of bridge. Reference point is 82 feet from right abutment and 2.2 feet above top of floor beam.
g Water surface 23.91 feet below top of upper channel of handrail 16 feet from face of right abutment on downstream side of bridge.
h United States Weather Bureau gage.

SUMMARY OF DISCHARGE PER SQUARE MILE.

The following summary of discharge per square mile is given to allow ready comparison of relative rates of run-off from different areas in the Ohio River drainage basin. It shows in a general way the seasonal distribution of run-off and the effect of snow, ground, surface, and artificial storage. But the most important fact worth noting is the almost entire lack of uniformity or agreement between any two streams. It indicates that the discharge of each stream is a law unto itself, and that all projects dependent upon stream flow, if they are to be developed along the safest and most economical lines, must be based on records of stream flow collected with great care over a long series of years as near the location of the project under consideration as possible.

Summary of discharge, in second-feet per square mile, for Ohio River basin for 1910.

Station.	Drainage area.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	Sq. m.													
Allegheny River at Red House, N. Y	1,640	1.52	1.34	8.35	3.21	3.01	0.82	0.38	0.20	0.61	0.44	1.76	1.10	1.90
Allegheny River at Kittanning, Pa	8,690	2.20	1.62	6.58	2.00	1.60	.83	.23	.15	.50	.46	2.21	1.43	1.66
Kiskiminitas River at Avonmore, Pa	1,750	5.50	6.40	3.95	1.54	1.04	1.63	.40	.11	.40	.13	.21	1.33	1.86
Blacklick Creek at Blacklick, Pa	403	5.46	3.52	3.92	1.69	1.14	1.06	.45	.12	.77	.20	.35	1.67	1.69
Tygart River at Belington, W. Va	390	5.41	3.49	1.12	1.43	1.74	6.28	1.03	.17	.29	.16	.38	1.46	1.90
Tygart River at Fetterman, W. Va	1,340	5.54	3.21	.93	1.02	1.42	4.05	.73	.12	.22	.08	.35	1.36	1.57
West Fork River at Enterprise, W. Va	750	5.13	2.76	.54	.18	.66	1.03	.43	.04	.58	.07	.34	1.51	1.10
Cheat River near Morgantown, W. Va	1,380	5.52	3.31	1.88	1.45	1.32	5.39	1.04	.23	.37	.21	.46	1.11	1.85
Youghiogheny River at Confluence, Pa	435	6.32	3.89	2.78	1.49	1.40	4.67	.55	.15	.24	.09	.16	1.11	1.89
New River at Radford, Va	2,720	1.14	1.72	1.26	1.02	1.01	2.51	1.28	.68	.94	.85	.58	.71	1.14
Greenbrier River at Alderson, W. Va	1,340	2.35	2.21	1.78	1.40	1.01	4.29	.93	.20	.46	.21	.17	.75	1.31
Miami River at Hamilton, Ohio	3,580	2.79	1.77	2.47	.54	.67	.24	.32	.10	.28	2.33	.48	.73	1.06
Dix River at Burgin, Ky	416	....	....	....	....	....	....	2.29	.78	3.66	.85	.67	1.92	....
Embarrass River near Oakland, Ill	535	1.93	.45	1.11	.24	1.15	.27	.75	.10	.17	.43	.07	.11	.57
Embarrass River at St. Marie, Ill	1,540	1.31	.66	1.13	.36	.95	.24	1.18	.25	.17	.87	.33	.33	.65
East Branch White River at Shoals, Ind.	4,900	2.39	1.34	2.18	.64	.96	.26	1.24	.26	.29	2.55	.31	.44	1.08
Skillet Fork near Wayne City, Ill	481	1.93	1.36	2.20	.22	.25	.02	.30	.002	.59	2.39	.13	.06	.79
French Broad River at Asheville, N. C	987	1.81	2.03	2.18	1.46	2.20	1.91	2.30	2.22	3.52	1.58	1.03	1.43	1.98
Tennessee River at Chattanooga, Tenn	21,400	1.64	1.81	1.69	1.11	2.10	1.83	1.98	1.17	1.09	.56	.39	.98	1.36
South Fork of Holston River at Bluff City, Tenn	828	1.46	1.41	1.13	.95	1.13	1.45	1.75	.66	.70	.37	.49	1.27	1.06
Holston River near Rogersville, Tenn	3,060	1.42	1.49	1.20	.80	1.24	1.34	1.53	.86	.99	.50	.48	1.10	1.08
Little Tennessee River at Franklin, N. C.	297	2.49	2.52	2.98	2.18	4.28	3.25	....	....	....	....	....	....	....
Little Tennessee River at Judson, N. C	675	2.86	2.67	3.22	2.08	4.30	3.26	3.11	2.46	1.43	1.28	.95	1.53	2.44
Little Tennessee River at McGhee, Tenn	2,470	2.47	2.60	2.68	1.91	3.49	3.21	3.12	1.89	1.49	1.07	.82	1.68	2.21
Tuckasegee River at Bryson, N. C	662	2.18	2.36	2.49	1.90	3.26	3.04	2.93	1.83	1.56	1.24	.92	1.66	2.11
Hiwassee River at Murphy, N. C	410	2.25	2.39	2.32	1.67	3.93	3.02	2.40	1.53	1.31	.94	.80	1.57	2.01
Hiwassee River at Reliance, Tenn	1,180	2.03	2.32	2.14	1.76	4.14	3.16	2.95	2.08	1.45	.92	.80	1.78	2.13
Ocoee River at Copperhill, Tenn	374	1.66	1.81	1.75	1.54	3.10	3.45	3.50	2.52	2.01	1.21	1.01	....	....

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